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ENCYCLOPEDIA



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KING GEORGE VI and QUEEN ELIZABETH  
PRINCESSES MARGARET ROSE and ELIZABETH  
In Coronation Robes



The  
HOME UNIVERSITY  
ENCYCLOPEDIA

—An Illustrated Treasury of Knowledge—

*Prepared under the Editorship of*

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WITH SPECIAL ARTICLES AND DEPART-  
MENTAL SUPERVISION BY 462 LEADING EDITORS,  
EDUCATORS AND SPECIALISTS IN THE  
UNITED STATES AND EUROPE

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# VOLUME VI

## Frith

**Frith, William Powell** (1819-1909), English painter. His early pictures are chiefly in illustration of Shakespeare, Scott, and Dickens; but in 1852 he realized his desire to reproduce contemporary life. Among his works are *The Derby Day* (1858), and *The Road to Ruin* (1878).

**Fritillary**, a genus of liliaceous plants, characterized by bearing solitary flowers, each with six petals, and a nectary to each petal. The common fritillary or snake's head of Europe is a bulbous plant, with narrow leaves, and a curiously checkered, drooping, purplish flower.

**Fritz, John** (1822-1913), American iron and steel expert, born at Londonderry, Pa. In 1860 he became general superintendent and engineer of the Bethlehem Steel Works. He was one of the first to introduce the Bessemer steel process into the United States. A medal to be awarded for discoveries in industry and science was established in his honor in 1902 by a group of American scientists and manufacturers.

**Fritzner, Johan** (1812-93), Norwegian philologist, born at Askö, near Bergen. His chief work is the admirable Icelandic-Danish dictionary, *Ordbog over det gamle norske Sprog* (2d ed. 1883-96).

**Friuli**, district, North Italy, formerly an independent duchy which embraced the present provinces of Udine, part of Venice, and part of Gorz and Gradisca.

**Froben, or Frobenius, Johannes** (1460-1527), German printer and scholar, born at Hammelburg (Franconia); founded a printing-house at Basel in 1491. He was the first to introduce the Latin character into German printing; his work gained a high reputation for accuracy and artistic value.

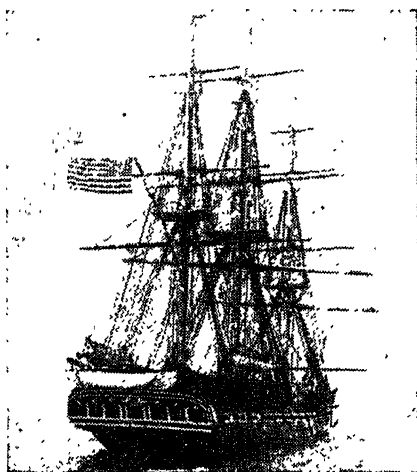
**Frobisher, or Frobiser, Sir Martin** (?1535-94), English navigator, was born probably in Yorkshire. He was the first Englishman to attempt a northwest passage to Cathay. In 1585 Frobisher sailed with Sir Francis Drake on the profitable expedition to the West Indies. In 1576 he discovered a bay in British North America, which was named Frobisher Bay.

**Froebel, Friedrich Wilhelm August** (1782-1852), German educator, born at Oberweissbach (Thuringia). From 1807 to 1809 he worked under Pestalozzi at Yverdon. Realizing the importance of the training of children before the age of seven—a subject with

## Frogmouth

which he deals in his *Menschenziehung*, vol. i. (1826)—Froebel opened in 1837 the first kindergarten, at Blankenburg, near Keilhau.

The basis of the Froebel system of education was development through voluntary activity; he held the object of all training to be the assistance of both mind and body to develop along the lines of natural growth. Man being an organism must be treated as such, and hence perfection in the early stages will, granted a suitable environment, ensure corresponding perfection in the adult stage. It was to provide a suitable training for the early stage, hitherto generally neglected, that the kindergarten system was established. See *Life*, in German, by Hanschmann (1900); reminis-



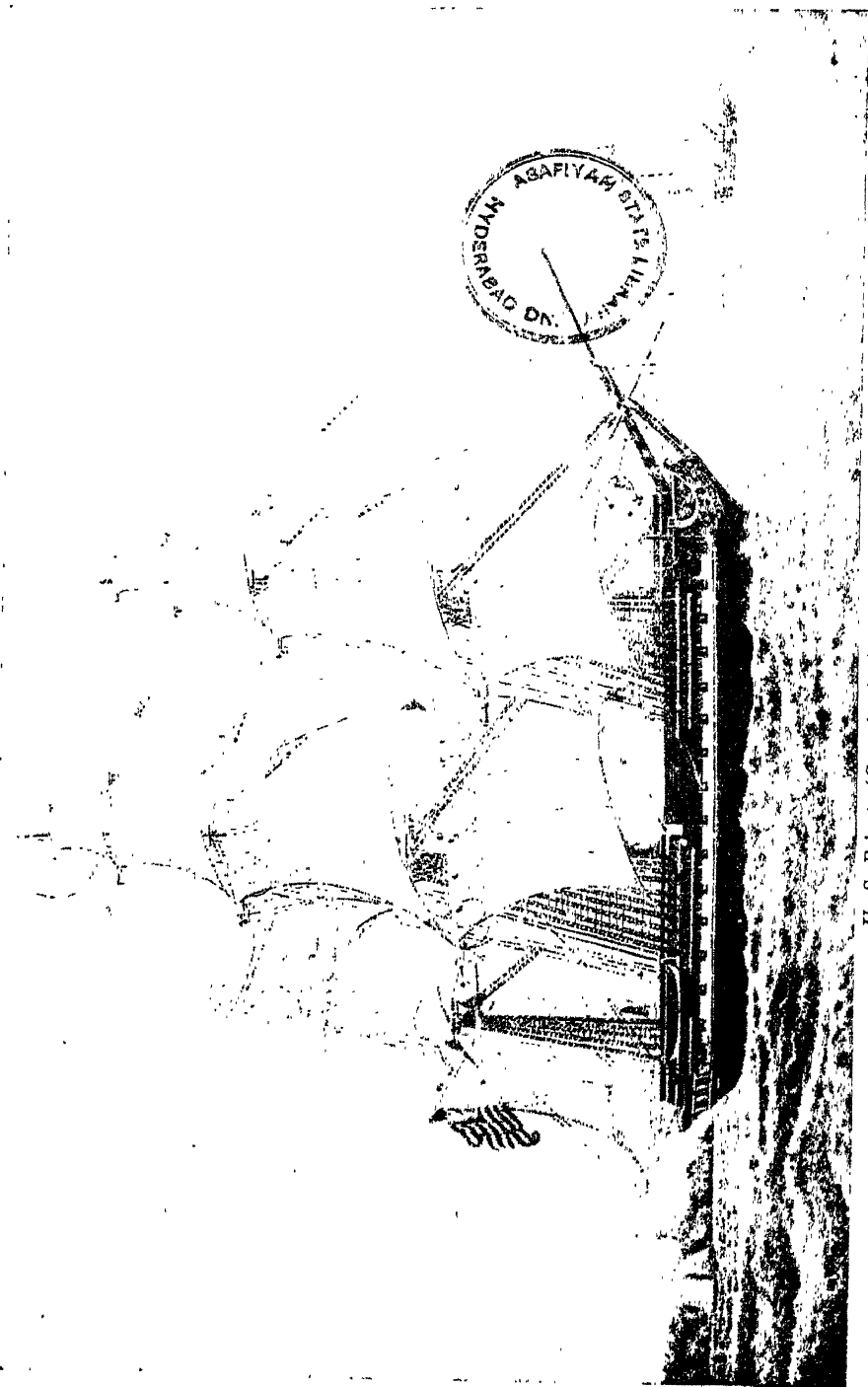
U. S. Frigate 'Constitution'.

cences by Marenholtz-Bülow, trans. by Mrs. Horace Mann (1887); also memoir by H. C. Bowen in the Great Educators Series, ed. by N. M. Butler (1897); and Froebel's *Autobiography* (Eng. trans. 9th ed. 1903).

**Frogbit**, a floating European plant (Hydrocharidaceæ). In America the aquatic, *Limnolium spongia*, is known by this name.

**Frog-hopper**, a popular name given to certain insects belonging to the order Hemiptera and the family Cercopidae. They feed upon the juices of plants, and form the frothy substance known as frog-spit, or 'cuckoo-spit'; hence also the name of 'froth fly.'

**Frogmouth**, a member of the family Podargidae, which includes some curious wide-mouthed birds. The frogmouths range from



U. S. Frigate 'Constitution'. From a Painting.  
(Copyright, 1904, by Enrique Muller.)

tive, these tadpoles soon begin to swim about freely, feeding on vegetable food or on refuse of various kinds; they soon lose their external gills, but acquire internal ones like those of a fish. Henceforth growth is rapid; hind limbs appear, and gradually increase in size, and the tadpole, especially if the water be foul, comes to the surface to breathe, showing that lungs are developing. About three months after hatching, the fore limbs, which have been concealed within the gill-chambers, are suddenly revealed, the tadpole ceases to feed, its tail gradually diminishes in size, and finally, the metamorphosis complete, it hops on shore as a tiny frog. After quitting the water the little frogs spend the remainder of the warm season on land, before beginning hibernation in the autumn.

The commoner frogs of the United States are the bull-frog, spring frog, common green frog, pickerel frog, wood-frog. Frogs are very useful in keeping down the mosquitoes and other insect pests bred in stagnant waters by devouring their eggs and larvæ; and, themselves furnish a large part of the food of many mammals, birds, and reptiles. For American species see Jordan's *Manual of Vertebrates* (new editions frequently), and *The Standard Natural History* (Vol. iii. 1885).

Frogs have for a long period been used for dissecting purposes, in order to acquaint students with the outlines of vertebrate anatomy. They furnish also the material for many physiological experiments. See Mivart's *Frog* (Nature Series, 1873), and zoological text-books generally.

**Frohman, Charles** (1860-1915), American theatrical manager, was born in Sandusky, Ohio. In 1890 he obtained a lease of the Madison Square Theater in New York, and in 1893 opened the Empire Theater with Belasco's *The Girl I Left Behind Me*, which was followed by a long list of successful plays. In 1895 he was the leading spirit in the formation of a powerful syndicate of American theater owners and managers. He was the manager or lessee of the Empire, Criterion, Savoy, Garrick, Knickerbocker, Herald Square, and other theaters in New York, and was interested in a number of theaters in London. He helped to prominence many well-known actors and actresses, including Maude Adams, John Drew, and Julia Marlowe. He lost his life when the Cunard liner *Lusitania* was sunk on May 7, 1915, by a German submarine, during the European War.

**Frohman, Daniel** (1853-1940), U.S. theatrical manager, brother of Charles, born in

Sandusky, Ohio. He became in 1884 manager of the Lyceum Theater, where he maintained a stock company for eighteen years, producing plays, chiefly of a society character, by DeMille, Bronson Howard, Clyde Fitch, and other American and English writers. In 1898 he leased Daly's Theater, and in 1903 opened the New Lyceum Theater. Georgia Cayvan, E. H. Sothern, Helene Dauvray, and Annie Russell came into prominence under his management. In 1915 he was appointed director of the Famous Players-Lasky Film Company. He served as president of the Actors' Fund.

**Frohschammer, Jakob** (1821-93), German theologian and philosopher, born at Ilkfen, near Ratisbon. In 1861 he published *Ueber die Freiheit der Wissenschaft*, in which he upheld the independence of science from theological control. Next year he founded the *Athenäum*, the organ of Liberal Catholicism, but refused to join forces with Döllinger and the Old Catholic movement. In it he wrote the first adequate account in German of the theory of natural selection.

**Froissart, Jean** (1337-1410?), French chronicler, was born at Valenciennes. In 1372 he began to write his famous *Chroniques*, which describe events in Western Europe from 1326 to 1400. It is not reliable from a historical point of view, but it presents a picture of the time which is unrivalled in its vivid color and its charm.

**Fromentin, Eugène** (1820-76) French painter and writer, born in La Rochelle. His earliest Salon pictures were two Algerian sketches and a French landscape, in 1847. His *Maîtres d'Autrefois*, a subtle critical study of the Dutch and Flemish painters, was not published until 1876. He was an acute critic of the technique of painting, and shows keen observation and study of the effect of sunlight on color. Some of his best works are in the United States: *Crossing the Ford*, and *Arabs Watering Horses*, in a private collection in New York, while his *Encampment in Atlas Mountains* is in a Baltimore collection. See Louis Gonse's *Eugène Fromentin* (1881).

**Fronde** is the name applied to the so-called leaves of ferns; but it is the scales on the fronds that are really the leaves.

**Fronde**, a general name for the party or parties in France which were hostile (1648-53) to the rule of Mazarin during the minority of Louis XIV.

**Frontenac, Fort**, a former fort built on the site of the present Kingston, Canada, in 1674. In 1758, during the French and Indian War, the fort was captured by the English under

Bradstreet—this being an important success, inasmuch as it gave the English control of Lake Ontario and practically cut New France in two.

**Frontenac, Louis de Buade, Comte de** (1620-98), succeeded Courcelles as governor-general of New France in 1672, holding the office until 1682, and again from 1689 to 1698. During his first administration he displayed great ability in dealing with the Indians and in his encouragement of the French explorers, Joliet, Marquette, and La Salle, who, with Frontenac's assistance, established posts at Mackinac, Niagara, and in the Illinois country.

**Frontinus, Sextus Julius**, prætor of the city of Rome in 70 A.D., and governor of Britain from 75 to 78 A.D., during which period he conquered the Silures. He wrote a work on the art of war, edited by Gundermann (1888; Eng. trans. by Richard Morysine, 1539). See also edition of the *De Aquis Urbis Romæ* by Herschel (trans.), *Two Books on the Water Supply of the City of Rome* (1899).

**Fronto, M. Cornelius**, Roman rhetorician of the 2d century A.D., tutor of Marcus Aurelius and Lucius Verus; became senator, and consul in 143.

**Front Royal**, a locality in the Shenandoah Valley. Here on May 23, 1862, about 1,000 Federals, under Col. Kenly, were captured by Gen. 'Stonewall' Jackson.

**Frost.** When the temperature of the air falls to 32° F. or below, there is said to be a frost. Frost, in other words, consists of the moisture always present in the air condensed at freezing temperatures upon plants and other objects near the surface of the earth. As frost produces great damage to plants during their early spring growth and also to crops maturing in the autumn, it is studied by meteorologists as a matter of great economic importance, and the United States Weather Bureau has devoted much attention to the subject, so that it is able to predict the occurrence of frost to fruit growers and other farmers in such districts as Southern California, Florida, and other places where the fruits or harvests are likely to be seriously damaged. Growing crops can be protected from frost by means of glass, cloth, or lath screens, or by covering the plants with straw, or in the case of cranberries flooding the marshes when frost is expected. Small fires producing intense smoke are also used in some sections of the United States.

In addition, there are various methods for charging the air with moisture, such as the use of evaporating pans and boilers, or spraying and sprinkling the plants when frost is

threatened. Irrigation also furnishes protection from frost, while heating the air by means of fires to produce a strong upward draft has been used in a number of fruit orchards. The United States Weather Bureau distributes warnings by telegraph, and telephone, usually in sufficient season to enable farmers to use whatever safeguards are available to protect their fruit or other crops. For further information on frost consult various articles in *U. S. Weather Bureau Bulletins*.

**Frost, Arthur Burdett** (1851-1928), American illustrator, was born in Philadelphia, Pa. The humor of his illustrative work is entirely natural, and he is particularly happy with his drawings for *Rudder Grange* (1879) and others of Stockton's books. He is perhaps at his best in depicting the comic mishaps of the amateur farmer. His publications include *Stuff and Nonsense* (1888), *The Bull Calf, and Other Tales* (1892), *The Golfer's Alphabet* (1898), *Book of Drawings* (1905).

**Frost, John** (1800-59), American compiler of histories and biographies for popular reading, was born in Kennebunk, Me. In 1845 he began to publish books, including school and juvenile books. They were often illustrated, and were very popular. Among them are *Pictorial History of the United States* (1844, 2 vols.), *Picture History of the World* (3 vols.), *Book of Heroes, Book of the Army, Book of the Navy*.

**Frost, Robert** (1875- ), American poet, was born in San Francisco. He was educated at Harvard College and Dartmouth College. His poetry, which is of high quality, realistically and sympathetically portrays everyday country life in New England. Among his publications are *A Boy's Will* (1915); *North of Boston* (1915); *Mountain Interval* (1916); *New Hampshire* (1923); *A Way Out* (1929); *Collected Poems* (1930); *A Witness Tree* (1942). Mr. Frost won the Pulitzer Prize for poetry in 1924, 1931, 1937, and 1943. He has taught at Yale, Harvard, Amherst, and the University of Michigan.

**Frost, William Goodell** (1854-1938), American educator, was born in Le Roy, N. Y. He won attention to the need and worth of the Southern mountaineers, and with expert advice blocked out a college with adjacent schools, not as feeders, but each with its own adaptations to a particular population group—Normal, Academy, Elementary, Vocational, and 'Foundation School' for retarded adults—as well as extension service for eight mountain States. For this enterprise he obtained gifts of more than \$10,-

000,000. In addition to articles in the periodicals, his publications include *A Greek Primer, Introductory to Xenophon* (1889); *University Extension in the Southern Mountains* (1898); *God's Plan for the Mountains* (1920).

**Frost-bite**, the effect produced upon any exposed part of the body by prolonged cold. A frost-bitten member becomes successively red, blue, and white, and loses all sensation; the local circulation of the blood ceases, and the tissues of the part affected die. If the frost-bite kills the part absolutely and at once, then later it drops off with dry gangrene.



Robert Frost.

When frost-bitten the part must not be too suddenly heated, or inflammation will follow. It should rather be first stimulated by gentle rubbing with snow or cold water. Gradually the temperature of the water may be raised as the part regains its color and sensation is restored, and friction may be more vigorous. Later, the part should be well protected for some time with warm coverings.

**Frothingham, Arthur Lincoln** (1859-1923), American archaeologist was born in Boston. He founded the *American Journal of Archaeology* in 1885, and was the owner and editor of it until 1896. In 1895-6 he was associate director of the American School of Classical Studies at Rome. Among his publications are *Stephen Bar Sadai the Syrian Mystic and the Book of Hierotheos* (1886);

(with A. Marquand) *A Text-Book of the History of Sculpture* (1896); *A History of Architecture* (1911).

**Frothingham, Ellen** (1835-1902), American translator. She gained reputation for her translations from the German, which comprised Lessing's *Nathan der Weise* (1868), Goethe's *Hermann und Dorothea* (1870), Auerbach's *Edelweiss* (1871), and Lessing's *Laokoon* (1874).

**Frothingham, Octavius Brooks** (1822-95), American Unitarian clergyman, was born in Boston, Mass. In 1860 he formed and became pastor of the Third Congregational Unitarian Church in New York City, a congregation that, with its head, attained such radical views as to separate itself from any regular religious organization, taking as its name the 'First Independent Liberal Church of New York.' His principal works are his *Life of Theodore Parker* (1874), *A History of Transcendentalism in New England* (1876), and *A History of Boston Unitarianism from 1820 to 1850* (1890).

**Froude, James Anthony** (1818-94), English historian and man of letters, was born in Dartington, Devonshire. In 1856 appeared the first two volumes of his *History of England from the Fall of Wolsey to the Defeat of the Spanish Armada*, a work which extended to twelve volumes and was concluded in 1870. Its main feature is the attempt to present Henry VIII. in a new light.

As a historian, Froude belongs to the literary, picturesque, and dramatic class. He has no sympathy with the scientific school, and is a follower of Carlyle in his belief in great men. He edited *Carlyle's Reminiscences* (1881), *Mrs. Carlyle's Letters* (1883), and wrote the *Life of Carlyle* (1882), raising quite a storm by his unflattering portrait of Carlyle. Among the more important of his later works are his *Life and Letters of Erasmus* (1894), and his *Lectures on the Council of Trent* (1869); and *Oceana* (1886).

**Fructidor**, the twelfth month in the French calendar inaugurated at the Revolution.

**Fructose**, fruit sugar or levulose,  $(\text{HO.CHI}_2.\text{CO}(\text{CH}_2\text{OH})_3.\text{CH}_2\text{OH})$ , occurs in fruit juices and honey together with dextrose, of which it is an isomer, with which it is also obtained on the inversion of cane sugar. It has been prepared synthetically, and is structurally a ketonic alcohol. It is very slightly sweeter than cane sugar, and it is used as a sweetening agent in diabetes, being prepared on an industrial scale from inulin.

**Fruit**, a term used to denote the fertilized

ovary of a flowering plant, and whatever structure may be incorporated with it. For the right understanding of any given fruit, a knowledge of the flower and of the process of fertilization, with its results, is necessary.

The part of the fruit covering the seeds, whether consisting of the carpels alone or with the receptacle superadded, is called the pericarp, or fruit-wall. Sometimes this is divided into distinct layers—which are called endocarp, mesocarp, and exocarp—from within outwards. The character of the ripe pericarp has been used as a criterion in distinguishing the different varieties of fruits. The classification generally accepted as simplest recognizes two great groups of fruits—dry and succulent.

Dry fruits are those having a woody or leathery pericarp, the cell-sap having disappeared. There are two classes of dry fruits, indehiscent and dehiscent. The indehiscent fruits are those in which the pericarp does not split open but continues to enclose the seed until the covering wears away or is burst open by the germinating embryo. Common examples are the hazel nut; the fruit of the family *Compositæ*, as the thistles and sunflowers; and the fruit of various grasses, as rice, wheat, barley, and maize. Dehiscent fruits, often called capsules or pods, are those in which, when the fruit is perfectly ripe, the pericarp splits to allow the escape of the seeds, which are themselves enclosed in a tough testa. Examples are the gentian, violet, poppy, peony.

Succulent fruits are those in which the tissue of the pericarp, or certain layers of it, remain succulent until the fruit is ripe. The majority of succulent fruits are indehiscent but some few are dehiscent, as the horse-chestnut, the walnut, and the banana. There are two main classes of indehiscent succulent fruits, the drupe or stone-fruit and the berry. In the drupes, examples are the plum, cherry, and peach. Examples of the berry are the grape, currant, tomato, date, etc.

In fresh ripe fruits the percentage of water varies from about 78 to 85, being as high as 95 in the watermelon. There is a fair percentage of carbohydrates, chiefly sugar and starches, a small proportion of protein and mineral salts, and a valuable amount of vitamins B and C. It is chiefly these vitamins and the mineral salts which make fruits a desirable addition to the diet.

The production of fruit for market is an important industry in the United States and elsewhere. It is discussed in this work under

the heading ORCHARDS and in articles on the separate varieties of fruit.

Fruits intended for marketing are preferably hand-picked, as otherwise a large proportion is jammed or bruised and thus rendered unfit for the best trade. The picking is done by trained workers, and the fruit is then graded and packed. For packing, various standard receptacles are used, generally barrels for apples, boxes for citrus fruits and berries, and baskets for peaches and grapes.

There are in general three methods of marketing fruit: outright sale to speculative buyers, consignment upon a commission basis, and sale through co-operative marketing organizations, the largest and most important of which is the California Fruit-Growers' Exchange. The co-operative method is the one in most favor in the United States. Apples are the most valuable of the orchard fruits, with peaches and plums next. There are several methods by which fruit may be preserved for future use, chief among which are preserving, canning, and evaporation or drying, and dehydration.

Consult Reid's *The Organization of a Fruit Distributing System*; Sears' *Productive Orchard-ing* (1914); Brown's *Modern Fruit Marketing* (1906); Lloyd's *Co-operative and other Organized Methods of Marketing California's Horticultural Products* (1919); Fraser *American Fruits* (1927); Auchterand Knapp *Orchard and Small Fruit Culture* (1929); Gardner *The Cherry and Its Culture* (1930).

**Fruit Bat**, a name given to all members of the family Pteropodidæ, also called flying foxes or fox bats, from the fox-like heads of the more typical forms. All the fruit bats are confined to the warm countries of the Old World.

**Fruit Pigeons** (*Carpophaga*), a genus of pigeons, including about fifty species, distributed throughout Australian and Oriental regions, but much more abundant in the former. They live in forests, are well adapted for arboreal life, and feed on fruits. The gape is wide; the plumage brilliant. See PIGEON.

**Fruit Sugar.** See **Fructose**.

**Frumentius, Saint**, apostle of Ethiopia and the Abyssinians, was born in Phœnicia toward the beginning of the 4th century. He and another youth, named Ædesius, were captured on the shores of Abyssinia, and taken as slaves into the service of the king, where they made themselves so beloved that Ædesius was raised to the office of cup bearer, while Frumentius became the king's private secretary and instructor to the young prince. He



gradually paved the way for the formal introduction of Christianity.

**Frustum**, in geometry, is the part of a solid next the base, left on cutting off the top by a plane parallel to the base. The frustum of a sphere or spheroid is any part of these solids comprised between two circular sections.

**Fry, Sir Edward** (1827-1918), English jurist, was born in Bristol. His international fame is based on his arbitratorship between the United States and Mexico in the Pious Funds case (1902), that between France and Germany on the Casablanca incident (1909), and on his office as ambassador extraordinary and first British plenipotentiary to The Hague Peace Conference (1907). His works include *A Treatise on the Specific Performance of Public Contracts* (1858), and several books on botany.

**Fry, Elizabeth** (1780-1845), English philanthropist, third daughter of John Gurney of Earlsam Hall, was born in Norwich. In 1810 she became a preacher among the Friends. After visiting Newgate in 1813, and introducing many improvements for the women, prison reform became the one great object of her life. She visited prisons in different parts of Great Britain and the Continent, and brought about many improvements in their management and discipline. Through her influence libraries were begun in the naval hospitals and the coast guard stations, and Bibles were supplied to them.

**Fry, Joseph** (c. 1828-73), American filibuster, was born in Louisiana. In 1873 he was captain of the filibustering steamer *Virginian*; was captured on the high seas off Jamaica by the Spanish man-of-war *Tornado*; and with fifty-six of his crew was shot as a pirate. See VIRGINIUS AFFAIR.

**Fry, William Henry** (1813-64), American composer and critic, was born in Philadelphia. He was best known as a musical composer and lecturer. His productions include the operas *Leonora* (1845) and *Notre Dame de Paris* (1863), and the symphonies *The Breaking Heart*, *A Day in the Country*, *Santa Claus*, and *Childe Harold*.

**Frye, William Pierce** (1831-1911), American legislator, was born in Lewiston, Me. He became a U. S. Senator, in succession to James G. Blaine (1881), and during his thirty years of continuous service devoted himself to the question of the Geneva award, to commercial legislation, and to the fisheries disputes. His greatest work as a legislator was done as member and chairman of the Committee on Commerce, and as member of the Committee on Foreign Relations. He advocated the exten-

sion of American commerce, and a strong merchant marine.

**Fryxell, Anders** (1795-1881). Swedish historian, was born in Hesselkog (Dalsland). His published works include *Handlinger rörande Sveriges historien* (1836-43), and his principal work, *Berättelser ur Svenska historien*, in 46 volumes (1832-70), a narrative history of Sweden from the earliest times to the death of Gustavus III. He is also the author of the first systematic grammar of the Swedish language, *Svensk Språklära*, and of *Bidrag till Sveriges litteratur-historia* (9 vols., 1860-2).

**F. S. E. C.**, Federal Securities and Exchange Commission. A U. S. New Deal agency.

**F. S. H. C.**, Federal Subsistence Home-steads Corporation.

**F. S. R. C.**, Federal Surplus Relief Corporation.

**Fuad I (Ahmed Fuad Pasha)** (1868-1936), king of Egypt, son of Ismail Pasha, was born in the palace of Gizeh. On the death of his elder brother in 1917, he became Sultan and on the termination of the British Protectorate in Egypt in 1922, was proclaimed King of Egypt, becoming the ninth ruler of the dynasty of Muhammed Ali, who was appointed governor in Egypt in 1805.

**Fuad Pasha, Mehmed** (1814-69), Turkish statesman and *littérateur*, was born in Constantinople. He received the title of Pasha (1855), in 1861 held the office of Grand Vizier, and in 1862 was minister of finance. He was a member of the Turkish Academy of Science and Belles-Lettres.

**Fuca, Juan de, or Apostolos Valerianos** (?-1602), Greek mariner of the 16th century, was born in Cephalonia. According to *Purchas his Pilgrimages* (1625), he discovered the strait which bears his name, and navigated it for twenty days.

**Fuca, or Juan de Fuca, Strait**, a passage separating Washington State from Vancouver Island, and connecting the Pacific Ocean with the Gulf of Georgia. It contains several islands, one of which, San Juan, became the subject of a dispute between Great Britain and the United States, the question being whether it was to be regarded as an appendage of Washington Territory or of British Columbia. In 1872 the Emperor of Germany, as arbiter, decided that the line of boundary should be run through the Strait of Haro, west of San Juan, thus awarding that island to the United States; and it, with several neighboring islands, now forms the county of San Juan, Washington; p. 3,605.

**Fucaceæ**, a term in botany applied to a small class of large brown seaweeds with branching fronds sometimes provided with air bladders. See SEAWEED.

**Fuchs, Johann Nepomuk von** (1774-1856), German chemist and mineralogist, was born in Mattenzell, Bavaria. Besides important researches he is remembered for his discovery of the process of stereochromy, a process for the preservation of frescoes by the application of soluble glass to their surfaces.

**Fuchs, Leonhard** (1501-66), German botanist, was born in Wemdingen, Bavaria. His botanical researches were summed up in his beautifully illustrated *Historia Stirpium*, (1542), a description of all the plants indigenous to Germany. He also formulated a botanical nomenclature.

**Fuchsia**, a genus of flowering plants of the natural order Onagraceæ, containing about seventy species. They are generally small shrubs or trees, natives of the Pacific Coast of South America, whence a few have ranged northward to Central America, and others to New Zealand.

**Fuchsin, Magenta, or Aniline Red**, is a salt, usually the chloride of rosaniline, which is triamidotolyl-diphenyl carbinol —  $\text{HOC}(\text{C}_6\text{H}_3\text{CH}_3\text{NH}_2)(\text{C}_6\text{H}_4\text{NH}_2)$ .

**Fucoid**, a term applied either to a seaweed belonging to the Fucaceæ, or a plant resembling such a seaweed.

**Fucus**, the generic name of various species of brown seaweed which form the main vegetation of rocky shores between tide marks. Commonest of all is *F. vesiculosus* (Rockweed, Bladderweed, sea wave, and the like), easily distinguished by its entire edges and paired air vesicles. On account of the large proportion of ash it forms a valuable manure. Besides manure, the only direct chemical utilization of the fuci is for the preparation of iodine.

**Fuegians**, the aborigines of Tierra del Fuego, of whom there are three distinct groups—the Onas in the east, the Yahgans in the center, and the Alacalrcfs in the west. They speak an independent stock language which has been reduced to written form, and into which parts of the Bible have been translated.

**Fuel Control**.—During the course of the Great War (1914-18) the various belligerent countries found it essential to exercise radical control of their fuel resources. In Great Britain certain restrictions were placed upon the enlistment of miners; government control of coal mines was established early in 1917; and the use of gas and gasoline for pleasure automobiles, and the consumption of fuel oil were

restricted. Conservation regulations were strictly enforced and any offenders severely punished. The French and Italian governments also assumed complete control of distribution after the outbreak of the war, and Germany very early established government control of coal.

In the United States, the Lever Act, giving the President authority to control the fuel situation, was approved Aug. 10, 1917; by August 21, the President had determined upon a provisional schedule of prices for bituminous coal not under contract; and on August 23 he appointed as Fuel Administrator, Harry A. Garfield, formerly president of Williams College. The chief functions of the Fuel Administration were concerned with four phases of the fuel problem: Production, Distribution, Limitation, and Conservation.

In World War II, rationing of fuel went into effect in the U. S. in 1942, its control becoming a function of the Office of Price Administration. Gas heating was practically 'frozen.' Oil-burning equipment manufacture was almost stopped and fuel was so scarce that large-scale conversion of heating plants from oil to coal was carried out. Coal was available, but anthracite was scarce in large sizes.

**Fuels**, substances which may be burned by means of atmospheric air with sufficient rapidity to evolve heat capable of being applied for economic services. Fuels are essentially hydrocarbonaceous substances, of organic origin, their value depending upon the amount of carbon and hydrogen—the essential heat-producing elements—which they contain. The majority of fuels contain also oxygen, nitrogen, sulphur, and phosphorus, together with a certain proportion of inorganic material which constitutes the ash. From a practical point of view, the chief value of a fuel is its capability of giving out heat during combustion. This heating capability (generally known as the calorific power) is the quantity of heat—measured in heat units—generated by the combustion of a unit weight, and is usually expressed in British thermal units per pound, calories per kilogram, etc. The heating power of a fuel is also expressed in evaporation units—by the number of pounds of water evaporated from and at 212° F. per pound of fuel, if all the heat were transferred to the water without loss.

Fuels may be conveniently classified as Solid, Liquid, and Gaseous. The principal solid fuels are coal, wood, peat, coke, and charcoal. Petroleum and vegetable and animal oils

are the liquid fuels most in use, with alcohols possibly included. For special uses, chemical derivatives, like amyl-acetate, are employed. Coal gas, water gas, natural gas, and producer gas are the chief gaseous fuels. Economically coals are by far the most important of the fuels. An old familiar classification of coal is as follows: (1) Anthracite. (2) Bituminous—(a) anthracitic coal; (b) coking and furnace coal; (c) gas coal; (d) non-coking, long-flame coal. (3) Lignite, or brown coal. (4) Cannel coal.

Fuel oil burners are of three general classes: (1) Mechanical sprayers, in which the oil under pressure is forced through nozzles that give high tangential velocity on exit; (2) carbureting burners, which largely vaporize the oil before its exit into the combustion chamber; and (3) steam or compressed air sprayers. The last are divided into outside and inside mixers, according as the steam or air is mingled with the oil before or after it leaves the final orifice.

Consult A. H. Sexton's *Fuel and Refractory Materials*; Mills and Rowan's *Fuel and its Application*; Fulton's *Manufacture of Coke* (1905); Damour's *Furnace Construction* (1906); U. S. Geological Survey *Report on Fuel Tests at the St. Louis Exposition* (1906); Redmayne's *Modern Practice in Mining* (1908); Tonge's *Coal* (1907); Brislee *An Introduction to the Study of Fuel* (1912); Brame *Fuel, Solid, Liquid, and Gaseous* (1914).

**Fuels, Calorific Power of.** The calorific power of any fuel may be determined by calculation, if its composition is known, or by burning a weighed quantity of the fuel, and absorbing the heat given off in a known weight of water. By the first method it is necessary to know the calorific power of each heat-producing element of which the fuel is composed. One pound of hydrogen, when burned with 8 lbs. of oxygen to form 9 lbs. of water, gives off 62,032 British thermal units (B.T.U.). Also, 1 lb. of solid carbon requires 2.67 lbs. of oxygen to form 3.67 lbs. of carbon dioxide (complete combustion), and 14,500 B.T.U. are available; but if the quantity of oxygen is reduced to 1.33 lbs., forming 2.33 lbs. of carbon monoxide, the heat evolved is only 4,400 B.T.U., and the combustion is incomplete. If the temperature of the products of combustion is above 212° F., the water formed will be in the form of steam, and the true calorific power of hydrogen would then be 62,032—(966 × 9) = 53,338 B.T.U. But when stating the calorific power of a substance, it is preferable not to deduct the latent heat of the water.

The effect of oxygen in a fuel is always adverse to its heating value. It is generally as-

sumed that the oxygen is already in combination with sufficient hydrogen to form water, and may therefore be left out of consideration in determining the calorific power. Let C, H, and O represent the weights of carbon, hydrogen, and oxygen in 1 lb. of the fuel. Subtract O — from H, and the remainder is the available

hydrogen. From the above figures it is evident that the calorific power of hydrogen is about 4.28 times that of carbon; therefore the calorific power of 1 lb. of fuel may be expressed thus: Calorific power (B.T.U.) = 14,500

$$\left\{ C + 4.28 \left( H - \frac{O}{8} \right) \right\}.$$

There are possible sources of error in the above method. The calorific power of the carbon and hydrogen as given assumes these bodies to be in the free state, not in combination as in a fuel, and their calorific powers when in combination may be different. Again, compound bodies never give out the same amount of heat on combustion as the elements of which they are composed would do in the free state. Hence, when the calorific power of a fuel is required with a practical degree of accuracy, it is advisable to determine it experimentally by means of a calorimeter.

One such is shown in Fig. 1. It is a modified Thomson's coal calorimeter. A weighed quantity (2 grams) of the coal to be tested is placed in a platinum crucible A, supported in a small metal brazier inside a glass bell E, which is secured to a base plate F by means of a brass ring and bayonet joint; there is an india-rubber washer between the bottom of the bell and the base plate, to form a water-tight joint. The bell and its connections are contained in a glass vessel H, which is supported inside a thick glass cylinder L, thus providing an air jacket to minimize losses due to radiation. The oxygen necessary to bring about the combustion of the fuel is introduced through a tube T, which is connected to the bell by a short piece of rubber tube 1, so that the tube T can be raised or lowered in the bell as may be required. The fuel is ignited by a short piece of fuse—cotton wick impregnated with nitrate of potassium—or by means of a platinum coil heated to redness by an electric current. The products of combustion pass downward through four small tubes in the base plate, escaping from nozzles, and rising through the water contained in the vessel H, give up their heat to the water. A sensitive thermometer N indicates the temperature of the water before and

after the experiment. The weight of water (2,000 grams) in the vessel H, and the water equivalent of the apparatus, must be known, also the rise in temperature of the water during the experiment, and any correction due to radiation and other losses. There are several other forms of calorimeters, but the principle involved is practically the same—measuring the heat given out on the combustion of a fuel by absorbing the heat in a weighed quantity of water.

**Fuero** (from Latin *forum*), applied in Spain to a code of laws, to national, provincial, and municipal charters, and to privileges granted to certain communities. *Fueros* formerly ap-

plied, lent large sums of money to the emperors Maximilian and Charles V., and his nephews were created counts of the empire by Charles. The family still survives. Consult Stauber's *Das Haus Fugger*.

**Fugitive Slave Laws** were two enactments of the United States (passed in 1793 and 1850), devised to facilitate the return to their masters of escaped slaves. The Constitution expressly provided that 'no person held to service or labor in one State under the laws thereof, escaping into another, shall, in consequence of any law or regulation therein, be discharged from such service or labor, but shall be delivered up on claim of the party to whom such



By Burton Holmes, from Ewing Galloway, N. Y.

*Fuji-san, from Lake Shogi.*

applied to charters of privileges and has been used to mean tribunals.

**Fuerteventura**, or **Forteventura**, one of the Canary Islands, east of Gran Canaria. Its capital is Betancuria, on the western coast; but its principal harbor is Cabras, on the eastern side. Area, over 650 sq. m.; p. 13,000.

**Fugger**, a family of merchant princes of Augsburg, tracing their descent to a certain Johann, who settled in Augsburg in 1368. The wealth of the family was largely accumulated by Jakob (d. 1469) and his sons, who mined silver in Tyrol, embarked in money-lending, and were successful in speculative trading all over Europe. One of these sons, Jakob (d.

1525), lent large sums of money to the emperors Maximilian and Charles V., and his nephews were created counts of the empire by Charles. The family still survives. Consult Stauber's *Das Haus Fugger*.  
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**Fugleman**, a soldier who used to be posted on a wing or flank of the regiment in advance of his comrades, to set the time for certain exercises, such as fixing bayonets.

**Fugue**, a musical composition of which the basis is imitation. It consists essentially in the development of a melody, from four to eight bars in length, announcing the subject; this is transferred to the key of the octave, the perfect fourth or the perfect fifth, above or below, and repeated with or without slight modification, to form the answer. Any number of parts may be used, but they should preferably be introduced early. Much freedom of treatment is allowable, together with almost unlimited intricacies in the development by means of episodes, double subjects, coda, etc.; and the composition should increase in interest as the end approaches. J. S. Bach is a master fugue writer; Handel's choruses and Mozart's symphonies afford many familiar and famous examples of the fugue. See Prout's *Fugue* (1891), and *Fugal Analysis* (1892).

**Fuji-yama, Fuji-san, Fuji-no-yama**, or, incorrectly, **Fusi-yama**, the highest mountain of Japan, 60 m. w. of Tokyo. Altitude, 12,425 ft. A dormant volcano of singular symmetry and majesty, it is a favorite subject with Japanese artists.

**Fu-kien, or Fo-kien**, maritime province in China, borders with Chekiang, Kiang-si, and Kwang-tung. It has a subtropical climate. Its foreign trade depends mainly on the tea exported from Foochow, the capital and chief town, and Amoy, but there has been a large falling off in the trade. The province is remarkable for its beauty, the mountains which line the rivers being exquisitely clad with shrubs and timber. The people on the coast are active traders and fishermen, and were formerly pirates and wreckers. The multiplicity of dialects and the peculiar customs of the people separate it in many ways from the rest of China; p. about 3,000,000.

**Fukui**, town, Japan, is noted for its paper and habutai silk. At the Renaissance Fukui became an important educational and ecclesiastical center; p. 59,943.

**Fukuoka**, town, Japan, has an old castle. It is chiefly famous for its silk and inwoven-picture fabrics; p. 146,000.

**Fukushima**, town, Japan, north of Tokyo, one of the first five ports opened to commerce. It is a trading center for raw silk and silkworms' eggs; p. 33,500.

**Fukushima, Yasumasa, Baron** (1853-1919), Japanese soldier and diplomat. In 1893, in accordance with orders from the Emperor,

he returned to Japan on horseback, making observations as he went through Russia and Siberia, a distance of 9,000 m. His international reputation was gained as commander of the Japanese contingent on the occasion of the Boxer uprising. For his services on this occasion he was knighted by Edward VII. In the war with Russia, he was known as one of the ablest of the Japanese strategists. He wrote a number of books on his travels and on military matters in the Far East.

**Fulahs** (otherwise **Fellata, Fellani, Fulbe**, and French *Peulhs*), the ruling native race in Nigeria and French Sudan. They are taller, fairer, and much less negroid than the surrounding Hausas. In 1802 one of their sheiks, Othman dan Fodio, inaugurated a religious war throughout Nigeria, and eventually conquered Hausaland for Islam. The campaigns of 1897-1903, however, compelled the Fulahs to acknowledge British suzerainty. They probably number from six to eight millions. See Ratzel's *History of Mankind* (1896).

**Fulcrum**. See **Lever**.

**Fulda**, town, Prussia, owes its origin to a Benedictine abbey founded in 744, and in 968 given precedence over all other abbeys in Germany. Attached to the abbey was a theological school, famous for centuries. The abbacy was converted into a bishopric in 1752; p. 27,000.

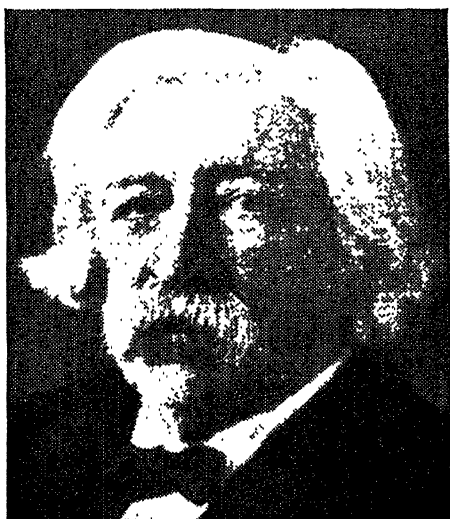
**Fulda, Ludwig** (1862-1939), German playwright. His dramatic career began with a tragedy, *Christian Gunther* (1882). He wrote a number of clever comedies—as *Unter vier Augen* (1886) and *Die wilde Jagd* (1893); several dramas—as, *Das verlorene Paradies* (1892) and *Die Zwillingschwester* (1901). The latter has been translated into English and presented in the United States. For his dramatic fairy tale, *Der Talisman* (1893), he was awarded the Schiller prize, but the German Emperor refused to sanction it. Fulda also wrote *Sinngedichte* (1888) and *Gedichte* (1890); *Die Geliebte* (1922); *Karneval des Lebens* (1925); *Bunte Gesellschaft* (1927); *Der Dummkopf* (1928).

**Fulgoridæ**, or **Lantern Flies**, a name given to a family of Hemiptera in which never more than two ocelli are present. In spite of the common name, satisfactory proof of luminosity in the family appears to be still wanting.

**Fulgurites**, thin glassy films on rocks. On mountain summits, such as those of the Alps, the surface of the rock shows in places a glassy film; fine depressions may be present, or small droplets of vitrified rock. It has reasonably been inferred that these are the effects of light-

ning. On sand-hills in many places, as in South America and North Africa, curious natural tubes have been found projecting above the surface, and these, when examined under the microscope, prove to consist of a thin film of glass enclosing sand grains. These, too, are known as fulgurites.

**Fuller, George** (1822-84), American painter, developed an impressionistic style which characterized his work in landscapes and heads. His most notable paintings were the *Turkey Pasture in Kentucky*, *And She was a Witch*, and *Winifred Dysart*. Fuller was a founder of the Society of American Artists. See Van Rensselaer's *Six Portraits* (1889).



Melville W. Fuller.

**Fuller, Melville Weston** (1833-1910), American jurist and Chief Justice of the U. S. Supreme Court. He was regarded as an authority on international law, and was appointed in 1889 a member of the convention at Paris to arbitrate an adjustment of the disputed boundary between Great Britain and Venezuela; and in 1905, one of the peace commissioners at The Hague. Among the important cases in which he gave his opinion were the nullification of the income tax law; the destruction of the Northern Securities merger; the Danbury Hat case, in which the labor unions were held to be amenable to the Sherman Anti-Trust law; and the case of *Inman versus the South Carolina Railway Company*, in which the railroad company was denied the power to exempt itself from liability for negligence in shipping goods.

**Fuller, Sarah Margaret, Marchesa Ossoli** (1810-50), American author, received a careful education, being very precocious in her youth. She first met Emerson in 1835, and soon became acquainted with other members of the famous group of Transcendentalists. In 1840-1 she edited *The Dial*, and in 1843-4 published her first books, *Summer on the Lakes* and *Woman in the Nineteenth Century*. She was an occasional visitor at Brook Farm, but not a resident there, as might be imagined from the ideal portrait of her in Hawthorne's *Blithedale Romance*. In 1844 Miss Fuller became literary editor of the *New York Tribune*. Her contributions to this paper comprise much of her best work, including not only literary criticisms, but many articles based on her investigations into the social conditions of the city. She was married to a young Italian, the Marquis Ossoli, in December, 1847. July 19, 1850 they and their son were drowned en route to New York. Selections from her autobiographical writings are given in the *Memoirs* by R. W. Emerson, W. H. Channing, and J. F. Clarke (1852). Her *Collected Works* (4 vols., 1855) were edited by her brother, Arthur B. Fuller. See *Life* by Julia Ward Howe (1883) and by Thomas W. Higginson (1884).

**Fuller, Thomas** (1608-61), English divine. His *History of the Holy Warre* (the Crusades) appeared in 1639, followed by numerous published works including *Good Thoughts in Bad Times*; *Good Thoughts in Worse Times*; *Church History of Britain*, including that of the University of Cambridge. At the Restoration he recovered his preferments and became a royal chaplain, but was carried from the pulpit of the Savoy to die, leaving *The Worthies of England* to be completed by his son. There was something of the statesman in his views. His imagination gives life to the driest details. See *Lives* by Russell (1874), Bailey (1874), Morris Fuller (1884); criticisms by Coleridge, Southey, Lamb; a complete bibliography in Bailey's edition of the *Collected Sermons* (1874).

**Fuller - Maitland, John Alexander** (1856-1936), author, musical critic, born London. He wrote a *Life of Schumann* (1884), *Masters of German Music* (1894), *Age of Bach and Handel* (1902), and *English Music in the Nineteenth Century* (1902); *Brahms* (1911); *The Spell of Music* (1926); and other works. His *English Carols* and *Fitzwilliam Virginal Book* are treasures of English music accessible to the public.

**Fuller's Earth**, is a soft, friable, granular clay with a greasy feel; it has a larger proportion of silica than ordinary clays; and it dis-

integrates when placed in water, forming an impalpable powder. Some varieties are blue, others yellow. The latter were most esteemed for practical purposes. These fuller's earth clays, which are not permeable, sustain large quantities of water underground, supplying many springs. American fuller's earth is used chiefly for deodorizing, bleaching, and clarifying fats, oils, and greases.

**Fullerton, George Stuart** (1859-1925), American philosophical writer and educator, born in India. Among his books are *Conception of the Infinite* (1887); *Plain Argument for God* (1889); *Philosophy of Spinoza* (1894); *System of Metaphysics* (1904); *Germany of Today* (1915); and *A Handbook of Ethics* (1922).

**Fulmar**, or **Fulmar Petrel**, a near ally of the giant petrel. It reaches a length of about nineteen inches, and though very variable in color, usually has the head, neck, and under surface white, and the back pearly gray, with darker wing quills. It is a Northern bird, and breeds in thousands on the Hebrides and other subarctic islands and coasts. It is known to sailors as 'mollemoke.' Only a single egg is laid, and there is practically no nest. See PETREL.

**Fulminates** are extremely explosive salts derived from fulminic acid or nitro-acetonitrile. The best known is *mercury fulminate*, a gray crystalline solid that explodes violently on friction or percussion, and is used as the explosive agent in detonators and percussion caps.



Robert Fulton.

**Fulton, Robert** (1765-1815), American inventor and engineer. At the age of seventeen he was apprenticed to a jeweller in Philadelphia. He also took up miniature and landscape painting, and in a few years earned sufficient money to buy a farm for the support

of his mother. His attention, however, was soon turned to mechanical inventions, and he took out patents for several useful appliances. In 1797 he went to Paris, where, in 1803, he constructed a small steamboat which navigated the Seine. He returned to America in 1806, and in 1807 launched the *Clermont*, which travelled by steam from New York to Albany (150 m.). She made the return trip in 32 hours, and thereafter plied regularly on the river. This was the beginning of successful steam navigation. He was later employed by the U. S. Government in canal construction. Among his inventions were a submarine torpedo boat, and a steam war-vessel, the *Demologos*. The latter was built by the government, and launched in 1815. See *Colden's Life* (1817); *Knox's Fulton and Steam Navigation* (1886); *Miller's Story of Robert Fulton* (1908).

**Fulton-Hudson Celebration**, marking the one hundredth anniversary of Fulton's inauguration of steam navigation, and the three hundredth anniversary of Hudson's discovery of the river bearing his name, extended from Sept. 25 to Oct. 9, 1909, and was observed by all the cities and towns along the Hudson River. A river parade was led by reproductions of Fulton's *Clermont* and Hudson's *Half Moon*.

**Fulvia**, a Roman woman of the 1st century B.C., married first to P. Clodius, then to Q. Scribonius Curio, and lastly, in 44 B.C., to Mark Antony. In 40 B.C., during his absence in the East, she raised a revolt in Italy against Augustus, and was besieged in Perusia. On its fall she escaped, and joined Antony at Athens, but was coldly received by him, and in the same year she died at Sicily.

**Fumaric Acid, Maleic Acid**, two organic acids having the same molecular composition ( $C_4H_4O_4$ ) and the same chemical constitution ( $COOH.CH:CH.COOH$ ), but differing in physical and chemical properties. Fumaric acid occurs in fumitory and some other plants. It forms very sour, needle-like crystals that are almost insoluble in water, and sublimes at  $200^\circ C$ . At higher temperatures it is converted into anhydrous maleic acid. Maleic acid crystallizes in the form of rhombic prisms which melt at  $130^\circ C$ . and are readily soluble in water.

**Fumigation**. 1. In medicine, purification by the burning or heating to the point of volatilization of drugs (such as sulphur) which when burned are antiseptic. Mercury also is used, volatilized together with hot steam, not for the purpose of disinfecting a room or clothes, as sulphur may be, but for its action upon the skin. Many antiseptics are used in

the form of vapor, either for general disinfection of rooms, or for local application to the mouth, throat, or lungs. 2. A process employed by gardeners for destroying certain insects which threaten the plants of conservatory, open garden, or greenhouse. Tobacco is the substance usually employed.

**Fuming** is the name given to the property that some gases and vapors possess of forming a white cloud in air. It is usually due to the formation of solid or liquid particles by union of the vapor with the moisture ordinarily present in the air.

**Fumitory**, or **Fumaria**, is a genus of herbaceous plants belonging to the order Fumariaceae. Among the European species is the common fumitory of waste ground, whose smoke was once thought useful for expelling evil spirits. The climbing fumitory trails its delicate stems and foliage, and drooping clusters of shell-pink flowers, over thickets.

**Funaria**, a widely distributed genus of mosses, common on old walls, ditches, and dry barren places, especially where a wood fire has been burnt. *Funaria hygrometrica* twists the stalk in proportion to the degree of moisture in the atmosphere.

**Funchal**, seaport town, and health resort, capital of the Madeira Islands; stands on the south coast of the largest island (Madeira). Although it has only an open roadstead, it exports wine, embroidery, and fruits. It is largely visited in winter by convalescents (mostly British) from pulmonary and other diseases; p. 50,000.

**Function**, in mathematics. In general, one quantity is said to be a function of one or more other quantities, when to each value of the latter there corresponds a definite value of the former. Thus the area of a triangle is a function of the base of the triangle since the area of the triangle decreases or increases with the decrease or increase of the base, the altitude remaining constant. The latter quantities are called the arguments of the function; frequently the phrase 'independent variable' is used instead of 'argument,' and the function is then called the dependent variable. Magnitudes, geometrical or physical, usually enter into calculations through their measures, and the word 'quantity' used above may apply either to the magnitude or to its measure; the measures will then be the variables.

Functions are divided into two main classes—(1) algebraic functions; (2) transcendental functions. In the calculus variables are supposed to be in general continuous. The functions considered in mathematics are usually

such that when their arguments vary continuously, the functions themselves vary continuously. It is a corollary from this statement that, when each argument makes only a small change, the function itself will only make a small change; and this statement holds true of all ordinary functions, except for special values of the argument or arguments.

The study of functions defined in a purely arithmetical manner has given rise to a special branch of mathematics called the *theory of functions*. See Harkness and Morley's *Introduction to the Theory of Analytic Functions* (1898); Merriman and Woodward's *Higher Mathematics* (1896); and Kennelly's *Complex and Circular Functions* (2 vol., 1914).

**Fundy, Bay of**, an arm of the North Atlantic Ocean, 145 m. in length and 35 m. in average breadth, between New Brunswick and Nova Scotia, Canada. The St. John River enters the bay on the n.w. side at St. John. At its head the bay divides into two branches. The rapid rise and fall of tides is noteworthy, the difference between high and low water at Chignecto being over 50 ft.

**Fünen** (Dan. *Fyen*), the second largest Danish island, lying between the Kattegat and the Baltic, and separated from Zealand by the Great Belt, and from Jutland by the Little Belt. Area, about 1,100 sq. m. It is a very fruitful island, and well wooded; p. 285,849.

**Fünfkirchen**, or **Pécs**, town, Hungary. The name is derived from five Turkish mosques, three of which are now in ruins and two in use as churches. There is a fine 12th-century cathedral. Manufactures leather, cloth, and pottery; p. 49,822.

**Fung-hwang**, the Chinese phoenix, regarded as a harbinger of prosperity; also as an emblem of good luck, usually embroidered on the robes of an empress.

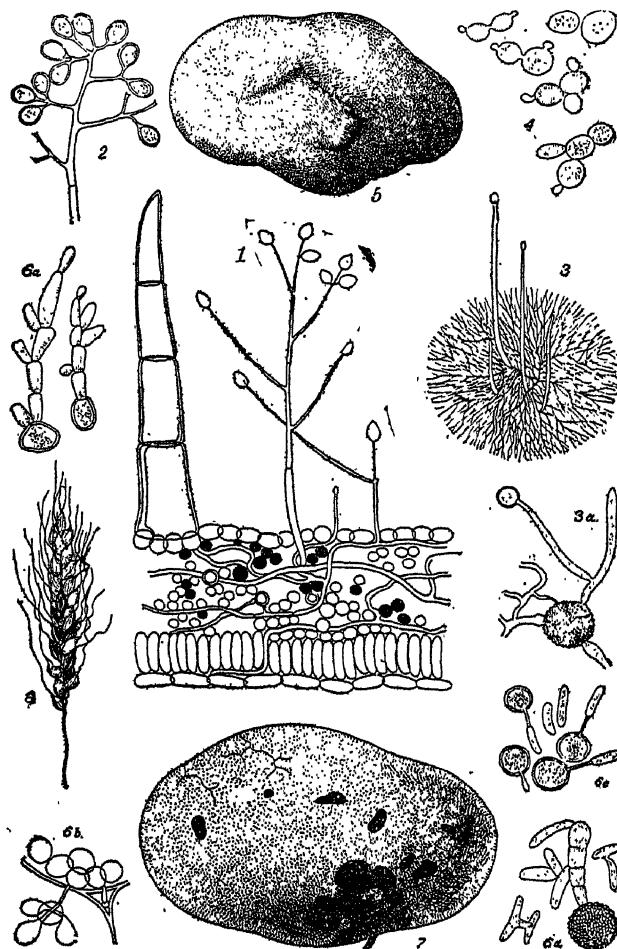
**Fungi**, a class of Thallophytes. The name is now generally confined to saprophytic or parasitic forms of green algae, distinguished by their lack of chlorophyll, whence follows their inability to assimilate inorganic substances. There are four main groups:—(1) In which the spores-cases bear some resemblance to those of the next group, but contain an indefinite number of spores; some of the species live in the tissues of host plants, and the yeast fungi also belong here. (2.) A large group, chiefly parasitic, with the spores developed in long tubular cases, including mildew fungi and the truffles; parasites on rye and insects; and the cup fungi and the morels. (3.) The brand fungi, causing smut in cereal plants. (4.) Basidiomycetes, including mushrooms and toad-



stools; puff-balls and earth-stars. See publications of N. Y. State museum on mushrooms, fungi, etc.; publications of U. S. Department of Agriculture, Washington, D. C.; McIlvaine, *One Thousand American Fungi* (1900); Gibson, *Our Edible Toadstools and Mushrooms*.

**Fungibles**, a term applied in civil law to such things as can be replaced by equal quantities and qualities, such as a bushel of wheat. When such property is loaned it may be consumed and its equivalent returned later under the form of civil-law contract of *Mutuum*.

**Fungicides**. Substances used to prevent or destroy fungous growths on plants. As with insecticides the character and application of the substance depend primarily upon the nature of the fungous growth itself, hence some knowledge of fungi is necessary to insure success. For this purpose fungi may be divided into two general classes: those growing within the vegetable tissues on which they feed and those growing wholly on the surface. The first can be successfully treated only during their short flowering period, while the second can



*Fungi, some of which are Destructive to Cultivated Plants.*

1. Details of the potato-disease fungus. 2. Mildew of the vine (*Plasmospora viticola*). 3. Mould (*Macor mucedo*). 4. Yeast fungus (*Saccharomyces cerevisiæ*). 5. Truffle. 6. Smut on barley (*Ustilago segetum*); 6a, spores; 6b, section of part of grain with smut; 6c, *Ustilago longissima*; 6d, *Ustilago tragopogonis*. 7. Puff ball (*Lycoperdum bovista*).

be treated at any time. The extension of these injurious parasitic growths has been very marked in recent years owing to the decline in soil fertility, the increase in fruit cultivation, and the ignorance and indifference of the great majority of farmers. The subject is now attracting wide attention, however, and both the National and State governments are rendering valuable assistance through experiments and by supplying information in regard to these plant diseases and their proper remedies.

Bulletins giving instructions for the preparation and use of fungicides may be obtained from the U. S. Department of Agriculture and the Agricultural Experiment Stations. Consult Duggar's *Fungous Diseases of Plants*; Massee's *Diseases of Cultivated Plants and Trees*; Stevens and Hall's *Diseases of Economic Plants*; Heald's *Manual of Plant Diseases* (1926).

#### **Fungus.** See **Fungi**.

**Fungus Beetle**, or **Fiddle**, a beetle found in Java and the vicinity. Its body, which is shaped somewhat like a fiddle, is about 3 inches long, but so flat it can creep into astonishingly narrow openings. It is often found under bark and behind fungi growing on trees.

**Funicular**, like or pertaining to a funicle—i.e., a rope or cord. The term is applied to rope railways, common in Switzerland.

**Funiculus**, a name given to the stalk by which the ovule or seed is often connected with the ovary wall or partition of flowers.

**Funk, Isaac Kauffman** (1839-1912), American author, editor, and publisher. With A. W. Wagnalls in 1877 he founded the publishing firm of Funk & Wagnalls, and he took an important part in the editorship of *The Standard Dictionary* and *The Jewish Encyclopedia*. In 1876 he founded *The Metropolitan Pulpit* (now *The Homiletic Review*), and later *The Voice* (1880), *The Missionary Review* (1888), and *The Literary Digest* (1889). He was perhaps best known because of his psychic research. His writings include *The Next Step in Evolution* (1902); *The Widow's Mile* (1904); *The Psychic Riddle* (1907).

**Funkia**, a genus of Liliaceæ allied to the day lilies. Since their introduction from China in 1790, the five or six species have been largely cultivated, not only in greenhouses, but in shrubberies and borders or rockwork. They are handsome plants with bold foliage, often quaintly marked, and with racemes of beautiful large and often fragrant flowers. See **DAY LILY**.

**Funnel**, in general, any shaft or passage through which light, air, or smoke is conveyed,

specifically the smokestack of a steamship. Ships' funnels are constructed of sheet metal, and are of circular or oval section. As a rule, they consist of an inner and outer stack stayed together by long bolts or rivets, and provided with a considerable air space between. The smoke and hot gases from the smoke boxes are conveyed along passages known as uptakes to the inner stack, through which they escape, while the surrounding air space prevents loss of heat by radiation, and thus maintains the gases at a temperature sufficiently high to insure a good draught. An additional casing fitted to the base of the funnel forms a second air space which still further checks radiation, and also aids in the ventilation of the fire rooms. *Funnel guys* of wire rope attached to a band fitted on the funnel of a ship at about two-thirds of its height, and secured to the deck or ship's sides, furnish the necessary support in a seaway. The height of the funnels of the *Mauretania* is 153 ft. from the base line of the ship. Funnel marks are designs painted on the funnels of steamers to designate their ownership.

**Funny Bone**, the popular name for that point on the elbow, a little to the inner side of it, and at the back, where the large ulnar nerve lies close to the surface in a groove at the back of the lower extremity of the humerus, or bone of the upper arm. When the point of the elbow is struck or rubbed forcibly, the ulnar nerve is irritated with the result that part of the arm and some of the fingers are numbed.

**Funston, Frederick** (1865-1917), American soldier, major-general. In 1891 he was botanist to the U. S. Death Valley Expedition, and in 1893 was engaged in botanical work for the Government in Alaska. In 1896-1901, he distinguished himself for bravery in Cuba and the Philippines. In Vera Cruz, 1914, he instituted important reforms in administration, sanitation, and education. He was placed in general command of the United States troops on the Mexican border and of United States troops in Mexico in March, 1916. He died, suddenly, at San Antonio, Tex. on Feb. 19, 1917. He is the author of *Memories of Two Wars* (1911).

**Fur**, the soft silky covering of many mammals, particularly those indigenous to cold countries. The animal's use of the fur is usually to give warmth, and thus frequently it is found that the winter coat constitutes a much more valuable product than the summer one. A notable example is the weasel, whose winter coat, under the name of ermine, is one of the

most costly of furs. For the same reason, as a general rule, the furs which are most prized are those which are obtained from mammals—as the bear and the Arctic fox—inhabiting high latitudes, for it is in these that the coat is densest. But the dense, close fur of the mole is related less to the necessity for warmth than to the protection of the skin from the irritating effects of particles of soil during burrowing. The somewhat similar fur of the beaver has partly, no doubt, a similar function; but more important is its power of throwing off water so as to prevent the chilling of the surface of the skin.

The fur trade is of prehistoric antiquity in Asia, while it first appeared in Europe about the 6th century, when sable skins were brought to Rome. Italian traders introduced Asiatic furs into Western Europe, but for centuries their use was confined to persons of wealth, and restricted by law: royal personages reserving certain kinds, such as ermine, and nobles of various ranks or religious orders keeping to themselves some other sorts. This rarity and exclusiveness was changed by the brisk traders who took advantage of the development of navigation and commerce following the geographical discoveries of the 15th and 16th centuries, since furs could then be brought more and more cheaply and unrestrictedly from Russia and the Far East, and the opening of America to trappers and traders offered an apparently inexhaustible supply of excellent furs at steadily lessening prices. Aristocratic restrictions could not withstand the combined abundance and cheapness of an article universally required for comfort as well as display, and the use of furs rapidly became general in all the varied forms of robes and garments now familiar.

The enormous amount of furs sent to Europe from Canada during the 17th and 18th centuries is almost beyond belief, and at the same time constantly increasing supplies were furnished by Asia. The result was a general use and cheapness far greater than at present, when furs of the better sort have again become a luxury. On the other hand, recent years have seen a tremendous demand for fur both for garments and trimming, with the result that research has discovered many different dyes to be used on the same skin to produce so-called different furs. Seal is a very warm serviceable fur. The preparation of the fur for market involves over 100 different processes.

The great fur markets of the world are London, Leipzig, and New York. Perhaps the

most important of the fur skins is that of the seal. This animal was rapidly becoming exterminated by its reckless slaughter. In consequence, an Act of Congress, approved Aug. 24, 1912, provided that all killing of fur seals within the jurisdiction of the United States in Alaska should be stopped.

Many of the popular furs are sold under names that are not correct, among which the following are the most common misnomers: American sable is sold as 'real Russian sable'; dyed fitch as 'sable'; dyed goat as 'bear'; dyed hare as 'fox'; kid as 'lamb' or 'broadtail'; dyed marmot as 'mink,' 'sable,' or 'skunk'; dyed mink as 'sable'; pulled and dyed musquash, pulled and dyed nutria, and sheared and dyed rabbit as 'seal,' 'electric seal,' 'Red River seal,' and 'Hudson seal'; pulled natural nutria as 'beaver and otter'; sheared and dyed opossum as 'beaver'; pulled and dyed otter as 'seal'; dyed rabbit as 'sable' or 'French sable'; white rabbit as 'ermine'; white dyed rabbit as 'chinchilla.' Lapin and coney are not misnomers however, since they are merely other terms for the word rabbit.

The literature on this subject is scattered through the reports of the U. S. Bureau of Fisheries, especially the annual Alaska Fisheries and Fur Industries and the Daily Consular and Trade Reports of the Bureau of Foreign and Domestic Commerce. Consult also Laut's *The Fur Trade of America* (1921); Ahern's *Fur Facts* (1922); Sachs' *Furs and the Fur Trade* (1923).

**Fur Farming**, the breeding and rearing of fur-bearing animals for commercial purposes. The growing scarcity of fur-bearing animals has been partially met—apart from the seal industry—by the establishment of a new and fast growing industry, that of fur farming, which has received substantial aid from the Bureau of Fisheries and the U. S. Biological Survey. The U. S. Department of Agriculture conducts fur farm experiments where careful research work is carried on.

The development of the karakul sheep in the United States has been fostered by the Bureau of Animal Industry, under whose supervision efforts have been made to produce a breed of sheep similar to the original karakul, or Persian lamb.

**Furka Pass**, a pass leading from Goeschenen (at the northern mouth of the St. Gothard Tunnel), in the Swiss canton of Uri, up the Reuss valley, past Andermatt, to the extreme head of the Rhone valley, close to the source of that river in the great Rhone Glacier.

**Furlong**. This measure of length, now rep-

representing one-eighth of a mile, was originally the length of the ancient acre, which had a definite form, being 40 rods in length by 4 rods in breadth. On the old English open or common field system, each furrow ploughed ran the length of the acre, and the distance was called *furlong* ("furrow-long").

**Furlo Pass**, tunnel through the Apennines in Italy, on the ancient Via Flaminia from Rome to Fano, constructed by the Emperor Vespasian in 77 A.D. It is 17 ft. wide, 14 ft. high, and about 120 ft. long.

**Furlough**, the authorized absence of enlisted men and non-commissioned officers in the army; sometimes applied also to similar absences from duty in civil life. An enlisted man on furlough may not leave the United States to go beyond the sea unless specially permitted to do so, and the number of men on furlough from any command must not exceed 5 per cent. of the enlisted strength. Soldiers on furlough are entitled to pay and to commutation of rations. The term furlough is applied to officers of the British army on foreign service but not to officers in the United States army. Consult *Regulations of the Army of the United States*.

**Furman University**, a Baptist educational institution at Greenville, S. C., founded in 1851 as successor to the Furman Academy and Theological Institution, established in 1826. It has collegiate and law departments.

**Furnaces**, devices for the useful application of heat produced, as a rule, by the combustion of fuel, but of late years also by the conversion of electrical energy. In modern usage the term furnace is applicable only to warm-air heaters, the term boiler being used for the central heater in steam and hot-water heating systems.

The modern warm-air furnace is either a cast iron or steel heater enclosed in a casing of galvanized iron of double thickness. The air is warmed in the area between the heater and the casing and then enters pipes. Almost any fuel can be used, coal either bituminous or anthracite, gas, oil, or coke.

The modern furnace is designed for complete combustion, and has flanges with deep corrugations to increase the amount of heat-radiating metal over which the air currents pass. There is a water fan from which constant evaporation of water moistens the warm air before it passes up into the house.

By means of an electrical thermostat regulated by a clock the furnace can be operated from a central point in the house so that no attention is necessary other than regular firing. Where gas and oil are used, the automatic

thermostat has made it possible to disregard the furnace during the entire heating season. In such cases the thermostat will maintain any desired temperature both day and night through automatic regulation.

Electric furnaces may be divided into three groups—resistance, arc, and induction furnaces. Low-temperature furnaces or ovens are usually of the *resistance type*. *Arc furnaces* are used where higher temperatures are required, as for the melting of metals. An *induction furnace* resembles a transformer.

Electric heat is inherently and fundamentally more expensive than the same amount of heat from fuel, but the prevention of contamination and the accuracy of temperature control frequently justify its use. Furthermore, the directness of application and better heat insulation permitted sometimes enable the reaching and maintaining of a given *temperature* with so many less *heat units* that the actual cost of the heat required is no greater than with fuel or may even be less.

Electric furnaces of any of the types described must be distinguished from those in which electrolysis takes place, as in the preparation of aluminum, and which are electrolytic cells rather than furnaces. Such cells may be distinguished by the fact that they work only with direct currents and not with alternating, which are as effectual or even necessary for electric furnaces proper. See Stansfield's *The Electric Furnace and The Electric Furnace for Iron and Steel* (1923).

**Furneaux or Flinders Islands**, a group in Bass Strait, between Tasmania and Victoria, Australia. The chief is Flinders, or Great Island (35 by 10 m.), the others being Cape Barren, Clark, Hummock, and Babel. They are mostly barren, and were named after Cook's lieutenant, Tobias Furneaux, who discovered them in 1773.

**Furness**, peninsula of North Lancashire, England. Rich beds of hematite iron ore were known and smelted at Walney in ancient times, and have led to the rise of the town and docks of Barrow. The ruins of Furness Abbey (founded 1127), near Dalton, are among the most interesting and picturesque in England, especially the Norman arches at the entrance to the chapter house. There are two effigies of Norman knights in Abbot's Chapel. The abbey was of Cistercian foundation.

**Furness, Horace Howard** (1833-1912), American Shakespearean scholar, is best known for his Shakespearean studies which materialized in his *New Variorum Edition of Shakespeare*, which was the first variorum edition

of the poet since that edited by Boswell's son and published in 1821. Although all of Dr. Furness' conclusions, as set forth in his prefaces and notes, have not received the acceptance of other scholars, his industry and general judgment in collecting the views of the best critics have been highly praised. In this work he was assisted by his wife, author of *A Concordance to Shakespeare's Poems* (1874), and by his son, H. H. Furness, Jr.

**Furness, Horace Howard, Jr.** (1865-1930), American Shakespearean scholar, son of H. H. Furness, was born in Philadelphia. He assisted his father on the *Variorum Shakespeare*, and continued that work after his father's death. He has edited *Macbeth* (1903); *Richard III.* (1908); *Julius Caesar* (1913); *King John* (1920); *Coriolanus* (1928).

**Furness, William Henry 3d** (1866-1920), American ethnologist, son of H. H. Furness, was born in Wallingford, Pa. He travelled extensively, and devoted special attention to the study of folklore, and to the psychology of the anthropoid apes. His writings include *Folklore in Borneo* (1899); *Uap, the Island of Stone Money* (1910).

**Furni Islands**, a small group of islands in the Grecian Archipelago, southwest of Samos. The largest is Furni (10 sq. m.), the only one inhabited.

**Furniss, Harry** (1854-1925), English caricaturist, was born in Wexford, Ireland. In 1880 he joined the staff of *Punch*, where his illustrations of the Parliamentary section were especially popular. He illustrated Burnand's *Incomplete Angler* (1887); Carroll's *Sylvie and Bruno*; Davidson's *Fleet Street Eclogues*; Lucy's *Diary of the Salisbury Parliament* (1892); and complete works of Dickens (1910) and Thackeray (1911). His writings include *America in a Hurry* (1900); *Confessions of a Caricaturist* (2 vols., 1901); *Going! Going! Going!—Political Sale Catalogue* (1914); and numerous motion-picture plays, in which he himself appeared.

**Furniture**, a word in its most restricted sense denoting the movable articles employed for use and comfort in a dwelling house, especially cabinet makers' work, such as beds, tables, chairs, bureaus, and desks. The history of furniture is intimately affiliated with the history of man.

The materials from which it is fashioned vary according to the resources and tastes of different countries and climates. The number of objects used by all early peoples, whatever the degree of their civilization, was very limited—a chest, table, chair, and couch being

the sum total of their household furniture. A warring, roving, outdoor life calls for but the simplest forms of comfort. But a more settled life and the growth of peaceful habits quickened the development of furniture making.

Of primitive furniture nothing remains. The rare examples taken from Egyptian tombs, or the sources of information gathered from pictures and sculptures, dating from about 4000 B. C., all reveal a highly specialized craft that was the result of long ages of furniture development. Wood was, and ever has been, the most favored material for furniture construction, for it has always been easily procurable, affords greater variety and lends itself readily to decoration.

Assyrian and Babylonian furniture was similar in form to the Egyptian, equally resplendent, though less graceful and refined. Greek furniture, though inheriting many Oriental qualities, possessed fundamental beauty and simplicity of line and restraint in ornament, which characterized its architecture as well. The Roman arts were but an elaboration of those created by the late Greek artists, and Roman craftsmen used gold and silver profusely for inlaying, and precious stones for embellishment.

With the fall of Rome 476 A.D., the brilliant luxury-loving life of Classic days was followed by the turbulent, violent period of the Middle Ages. It was a chaotic time hardly conducive to any progressive development in the domestic arts, yet they managed to survive. There were two distinct styles that influenced furniture design at this time. The Byzantine, a debased mingling of the Roman and Oriental, and the Romanesque, a fusion of the North and South exemplified in German and Latin civilizations.

Little is known of furniture attributed to the 10th to 14th centuries except what can be gathered from old missals and manuscripts. After the Norman invasion, times became more settled, and the domestic arts profited by this quieter influence. Chests were more elaborately carved with panels of tracery, strongly built with iron bandings and heavy iron locks, that made them safe to carry tapestries and valuable goods from one stronghold to another. Bedsteads consisted of wooden frames with richly carved posts and testers, upon which handsome stuffs and elaborate tapestries were hung. Wall tapestries were the chief splendor of feudal castles and homes, and, as highly valued possessions, they could be packed in chests and carried from place to place.

From 1216 to 1272, wooden paneling was first introduced upon interior walls, and a few hundred years later, the Gothic or Pointed style became the great æsthetic impulse that dominated and inspired builder, sculptor and wood carver alike. The designer who planned cathedrals and monasteries planned their furniture as well, and naturally domestic furniture took on the same quality. The linen-fold and tre-foil patterns, the best known designs, Flemish in origin, became identified with this period. The late English Gothic, with a mingling of Italian and Flemish ornament, developed finally into the style known as 'Tudor.'

In Italy, until the latter part of the 15th century, design was a mixture of the Byzantine and Gothic. But about this time there arose the most distinctive epoch in the history of art—the brilliant revival of Classic civilization known as the Renaissance, which had its birth in Italy, but which spread throughout Europe arousing everywhere a fresh interest and impetus in science, literature and art. Though it reached its finest flowering in Italy, all the countries in Europe were deeply influenced by this return to classicism, and mingling as it did with native art, each country kept something of its own individual style, so that we speak distinctively of the Italian, French, English, German and Spanish Renaissance.

In Italy the furniture of the early Renaissance period was simple and dignified, usually rectangular and architectural in form, decorated by plain mouldings, or panelings or by harmonious carvings, paintings and intarsia. Some of the early chairs were in the form of a folding stool, or there was the curule or cross-legged chair, both types of Roman descent.

In the second or culminating period of the Renaissance, furniture became more formal and more elaborately decorated and sumptuous in form, to accord with its palatial surroundings. Architectural motifs predominated, and columns, pilasters, and cornices were used with carvings in high and low relief. The human figure was introduced as a constructive element. Metal enrichments as well as bas-reliefs of ivory and tortoise shell.

Designs became more and more elaborate, rectangular and architectural forms were discarded, and decorations assumed so profuse and exaggerated a character that the final period of decadence became inevitable.

While the unparalleled beauty of the Renaissance was making its way to France and penetrating into other countries further North, it had already begun to show its decline in Italy. Italian architects and painters were early sum-

moned to France and with the reign of Francis I., the Renaissance was definitely there.

Spain came strongly under Italian Renaissance influence, but her decoration and use of Renaissance motifs were overly exaggerated. The chief characteristic of German furniture of this period, was 'an exuberant realism and a fondness for minute detail,' but in England the new impulse was slower to take root, and many national characteristics remained, keeping intact a certain native individuality. During this period of development, the chest evolved into a cabinet of many varieties; the simple *prie dieu* chair became an elaborate affair, and tables were now solid pieces of furniture instead of heavy boards and trussels as they were at the beginning of the Renaissance.

In England the 'court cupboard,' which became the forerunner of the future sideboard, made its appearance. It was made from native oak, the distinctive wood of the period. The continued growth of the English Renaissance in the 17th century, mingling with the ideals of Flemish workers in the Netherlands developed the Jacobean style.

The refectory table, showing four or six legs, at first increasingly bulbous, but later becoming more refined in design, and the gateleg table of oak, with turned or spiral legs, were developments of this time. The first couch with adjustable head-rest and elaborately carved legs and stretchers also belongs to this period, and is the first premonition of the later day-bed or chaise-longue. Walnut was used for the first time in the later examples of Jacobean furniture. The William and Mary and Queen Anne styles that followed largely reflected Dutch and some French influences. The delight in gay decorations, lighter forms and more elegant French interiors and furnishings, began in the reign of Francis I., and by the end of Louis XIII.'s régime, Italian influence had waned, and France had created and was expressing a native taste of her own. This developed into three very distinct styles to which the three monarchs have given the names of 'Louis Quatorze,' 'Louis Quinze,' and 'Louis Sieze,' each style merging into that of its successor. The majestic grandeur of those royal pieces created in the time of Louis Quatorze, later verged upon the effeminate in the desire for freer curves, ever greater adornment and embellishment, until their over-elaboration culminated in the rococo style of Louis Quinze.

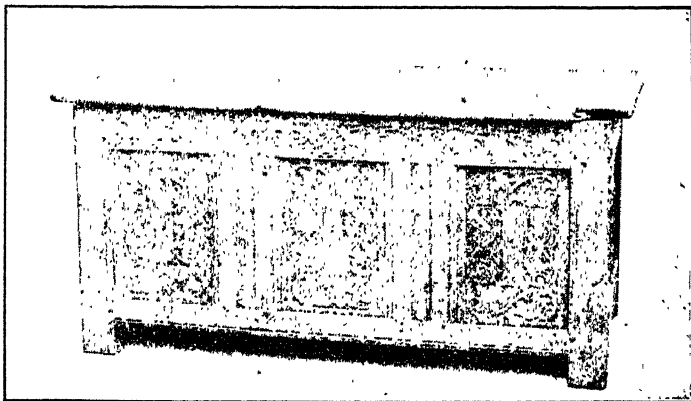
The reaction against over-elaboration combined with the revival of classic taste through



*French Cabinet of Walnut, 16th Century.*

the discoveries of ancient treasures in Herculaneum and Pompeii, produced the dominant style under Louis XVI., in which symmetry of form, restraint in ornament and the most chaste beauty of detail, is perhaps more delightful and perfect in achievement than anything that has ever been done in furniture.

interpretation of the Classic and in its heavy masculinity it reflected the entirely new spirit later to end in disaster, that animated France. At its best, it possesses a certain imperial dignity. Articles were fashioned from mahogany and rosewood with no carving, but their large plain surfaces of beautifully grained wood had



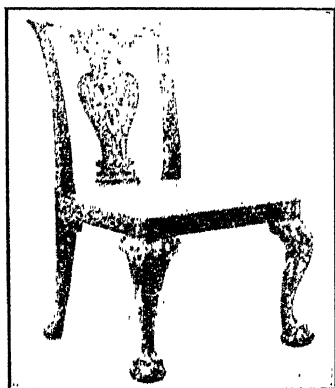
*American Oak and Pine Chest, 17th Century*

Indeed, the 18th century stands out as the pre-eminent era of the cabinet maker.

The greatest feats in craftsmanship were achieved by such men as David Röntgen, Gouthière, Riesener, Oeben, Rousseau de la Rottière, Jacob, and others. After the un-

rather heavy motifs of ormolu or bronze.

The 18th century brought forth a brilliant school of cabinet makers in England—the names of Adam, Chippendale, Sheraton, Heppelwhite, and Shearer, all master craftsmen and designers, became renowned, making the



*Mahogany Pre-Chippendale Chair, English 18th Century*



*French Chair of Gilded Wood, Grospoint Covering, Louis XV Period*

happy ending of Louis xvr. and Marie Antoinette, the Directoire style, still fostering Classic design, was shortly followed by the so-called Empire period under Napoleon I. Though lacking in inspiration and grace, this development is interesting, because it, too, was an

latter part of the century one of the most important epochs in English furniture making. The use of mahogany began about the year 1720, displacing walnut. Satinwood and softwood, which was painted, gilded or japanned, were also used, as well as a choice of figured



woods for veneer and inlay. The brothers Adam were architects and designed all the objects for the interiors they planned. Painting was their favorite form of decoration, and artists of renown were employed to embellish many of their important pieces.

Chippendale carried out some of Adam's designs, but also introduced ideas of his own. He continued the development of the cabriole leg, with or without ball and clawfeet, and evolved characteristic forms of decoration by which his designs can easily be distinguished. The two other notable personalities of this period were Sheraton and Heppelwhite, whose contributions in both the design and execution of furniture making have not been equalled since.

At the close of the century, England coming under the influence of the decadent spirit exemplified in the French Empire, developed what is known as the English Empire, and thus the great creative eras of furniture making were brought to a close.

The term 'Colonial' has been erroneously and promiscuously applied to American pieces, even including Empire, whereas nothing is Colonial that follows 1776, and strictly speaking, the term should not be applied to furniture that came later than Chippendale. The very early pieces are Tudor and Jacobean in type, some having been brought from England by the early comers who first settled in Virginia in 1607. They include chests, buffets, court cupboards, chairs, tables, and stools, from which American pieces were copied.

The middle of the 17th century ushered in other types—Cromwellian and Spanish examples among others, and in the Northern States during the latter half of the 17th century, the manufacture of English and Dutch types became more characteristically American. The pieces fashioned in the North were simpler than their prototypes or those made in the richer and more prosperous Southern States. Flemish chairs with elaborate scrolls and caned seats and backs became popular at this time.

As the 18th century advanced, and Chippendale and his fellow-workers became the leading craftsmen and designers in England, pieces following their design were exported to America, and mahogany, the wood then in vogue in England, largely took the place of the native American woods. Many fine examples of furniture were made in Philadelphia from about 1725 to the end of the Revolution, when the names Savery, Randolph and Gilling became celebrated. Duncan Phyfe, one of the first

great cabinet makers of America was called the American Sheraton. Beautiful specimens also came from Alexandria, Virginia; from Baltimore, Boston, Annapolis, and Newport, Rhode Island, the latter place boasting of the production of fine desks and chests by one John Goddard.

At the end of the 18th century, the American Empire, following the French type of that name came into vogue, after which the period of Louis Quinze claimed attention with its elaborate scrolls and curves. In England, ornament of this type lost all restraint, forms became heavy and ponderous, and the furniture and furnishings of this period, which is known as the Victorian Age, degenerated into an era of extraordinary ugliness and poor taste. Machines were used for the purpose of economizing labor and expense, and workmanship became clumsy and mechanical. America, too, passed through the 'Victorian Age,' the most menacing to art in all history. Fortunately, a desire for beauty was reawakened, and since no striking creative impulse manifested itself, a passion for antiques of all periods that lent themselves to modern living was again revived. Originals were eagerly sought and copied, until the supply of beautiful, old examples ran low.

The Modernistic Movement is now receiving recognition by a growing number of people who repudiate for the time being at least, 'period furniture.' This modernistic style shows a fresh spirit of its own. It originated in Austria and Germany, took flame in France, and has now spread to America. At first it departed entirely from curves, and affected the square and angular. More recently, however, it has modified this tendency, though still laying its chief emphasis on the functional rather than the decorative aspect of furniture design. Modern furniture is designed on straight lines which can be accomplished more easily with the modern tool—the machine, and its surfaces are skilfully finished, revealing when possible, the wood's beauty of grain and natural coloring. It depends for its effect upon form, eliminating all carving and other decorative elements. Wood and metal vie with each other for supremacy in its construction.

Among the outstanding designers of modern furniture in America are Paul Franke, Gilbert Rohde, Donald Deskey and Walter von Nessen.

Among a long list the following books may be cited: Burgess' *Antique Furniture*; Singleton's *Furniture and the Furniture of Our Forefathers*; Dyer's *Handbook of Furniture Styles* (1918); Sanders' *How to Know Good Furni-*

ture (1924); Clason's *The Story of Period Furniture* (1925); Gayler's *Furniture, Yesterday and Today* (1926); Richter's *Ancient Furniture* (1926); Scmitz' *The Encyclopedia of Furniture* (1926).

**Furnivall, Frederick James** (1825-1910), English philologist, was born in Egham, Surrey. Appointed in 1854 honorary secretary of the Philological Society, he largely influenced the compilation of the *New English* (or *Oxford*) *Dictionary*, which began to appear in 1884. In 1864 he established the Early English Text Society; in 1868 the Chaucer and Ballad Societies; in 1874 the New Shakespeare Society; in 1881 (with Miss Hickey) the Browning Society; in 1882 the Wycliffe Society; and in 1886 the Shelley Society. Among his numerous publications may be mentioned *Saint Graal*, in English verse, by Henry Lonelich, A.D. 1440 (2 vols., 1861-3); *Six-Text Print of Chaucer's Canterbury Tales* (1868-77); *Hoccleve's Works* (part i., 1892; part iii., 1897); *The English Conquest of Ireland, A.D. 1165-85*, from Giraldus Cambrensis (1896). With John Munro he wrote introductions to the 39 volumes of the *Century Shakespeare* and of *Shakespeare's Life and Work* (1908). Consult *Frederick James Furnivall; a Volume of Personal Record* (1911).

**Fürstenbund, The, or League of Princes**, a league of German princes formed by Frederick the Great on July 23, 1785, whose object was to check the attempt of the Emperor Joseph II. to secure Bavaria. It embraced Prussia, Saxony, Hanover, and numerous smaller German states.

**Fürth, or Fuerth**, city, Bavaria, in the province of Middle Franconia, 5 m. n.w. of Nuremberg, with which it forms an important manufacturing center. There are four evangelical churches, the most noteworthy of which is St. Michael's, built in the 14th century, and a fine synagogue. The city is said to have been founded by Charlemagne. In 1632 it was unsuccessfully besieged by Gustavus Adolphus, and in 1634 it was burned by the Croats. The city passed from Prussia to Bavaria in 1806; p. 77,000.

**Fur Tribe**, a negro people who inhabit the central highlands of Darfur, in Eastern Sudan. Since 1899 they have been under Anglo-Egyptian dominion. They embraced Mohammedanism in the 15th century.

**Fury and Hecla Strait**, Canada, in 70° north latitude, separates Melville Peninsula from Cockburn Island, and connects Fox Channel with the Gulf of Boothia. It was

discovered by Parry in 1822, and named after his ships.

**Furze** (*Ulex*), a European genus of very branched and thorny shrubs, with linear, sharply pointed leaves, solitary flowers, and two-lipped calyx, belonging to the order Leguminosæ. The common furze (*U. europæus*), also called *whin* and *gorse*, is found in the southern parts of Europe and in Great Britain.

**Fusan, Fu-san, or Pusan**, treaty port and capital of Korea, is situated on Korea Bay. Since the formal annexation of Korea to Japan in 1910, extensive improvements have been made in lighting facilities, water works, and roads. Fusan was opened to foreign trade in 1876; p. 73,855.

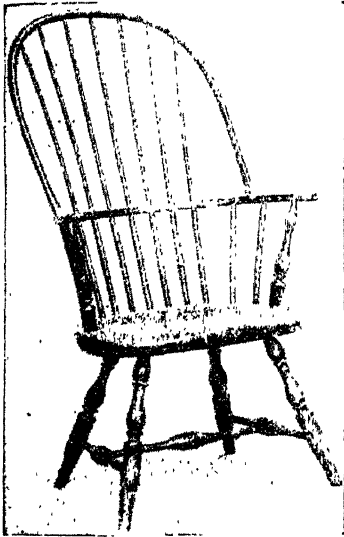
**Fusaro, Lake of**, also called the **Acherusian Lake**, a small lake of Italy, 6 m. w. of Naples, famous for its oysters.

**Fusee**, (1.) A match with a large oval head of a mixture of charcoal, saltpeter, cascarilla, glass, and gum, tipped with some common igniting composition. The fusee flames when struck, but thereafter forms a glowing mass, and thus serves for ignition purposes in a high wind. See **FUSES** and **PRIMERS**. (2.) The *mechanical fusee*, formerly used in clocks and watches, is a spirally grooved cone connected by chain or catgut with the mainspring. See **HOROLOGY**.

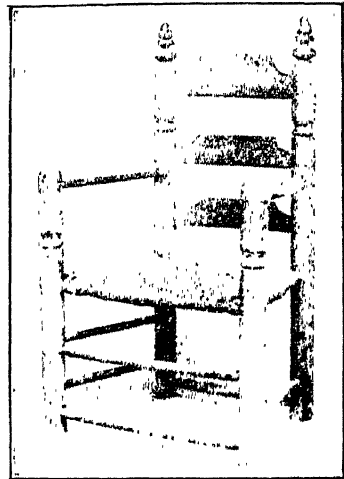
**Fuseli, Henry, or Johann Heinrich Füssli** (1741-1825), Anglo-Swiss painter and author, was born in Zürich. His paintings, some 200 in number, include *The Nightmare* (1781), and two series to illustrate Shakespeare's and Milton's works. His *Lectures on Painters* contain some of the best art criticism in the English language.

**Fusel Oil** (**Fousel Oil**), known also as **Potato Spirit**, a colorless, oily fluid with a disagreeable odor and burning taste. It is a frequent impurity in spirits distilled from fermented potatoes, barley, rye, etc. Fusel oil is separated from ordinary alcohol largely by distillation, or by filtration. It is utilized chiefly in the preparation of amyl acetate for solvent and flavoring purposes, in patent varnishes, and as a solvent for barks.

**Fuses (Fuzes) and Primers**. Fuse is the name given to a variety of devices for firing explosives contained in military shells or mines, or used in blasting operations. The earliest were time fuses, consisting of a copper or iron tube filled with a slow-burning composition which was lighted from the flame of the powder charge. No regulation of the time of burning was possible until wood was substituted for metal in the outer casing. The first successful



*Hickory Windsor Arm Chair,  
American 18th Century.*



*American 17th Century Arm Chair  
of Maple and Hickory*



*Courtesy of P. T. Frankl*

*Modernistic Bookcase and Table*

percussion fuse was invented shortly after the discovery of fulminate of mercury in 1799. Modern fuses are of three general classes: Percussion, Time, and Combination.

The percussion fuse consists of a cylindrical brass case, threaded to screw into the projectile. Inside the case is a priming charge of black powder, a percussion cap, and a plunger holding a firing pin. During flight, the motion of the projectile holds the plunger away from the cap; but when the projectile strikes, and its motion is checked suddenly, the plunger continues to move forward. The firing pin explodes the cap, the flame from which ignites the priming charge, which in turn ignites the bursting charge of the shell directly if of black powder, or through a detonating fuse if of high explosive.

The time fuse contains the same elements as the percussion fuse, and in addition either a time train of compressed meal black powder, or a clockwork mechanism. The time fuse is now used only to help form the combination fuse.

The combination fuse consists of a time and a percussion fuse assembled in one body. It is a point fuse, and is used principally in shrapnel. The time element is set going by the concussion of discharge, while the percussion element acts only when the shell strikes if the time element has not acted before impact.

The mechanical fuse was first developed by the Krupps, and contains a clockwork mechanism instead of the time train of black powder. When the bursting charge of a shell is a high explosive, the black powder fuse is not sufficient to secure explosion, and a *detonating fuse*, containing some violent and sensitive detonating composition, is introduced between the bursting charge and the percussion fuse.

In blasting and mining operations the fuse generally employed is an electric detonating fuse, containing electric elements similar to those of the electric primer, and in addition a detonating composition.

The primer is a device employed to ignite the powder charge in guns. It consists of a brass tube filled with black powder, and containing devices for igniting the black powder and for preventing the escape of powder gas through the vent. Primers are classified, as to the method by which ignition is produced, into Electric, Friction, and Percussion. A combination primer may be fired by any two of these methods.

See AMMUNITION; EXPLOSIVES. Consult publications of the Ordnance Departments, U. S. Army and U. S. Navy; *Journal U. S.*

*Artillery*; Weaver's *Notes on Explosives* (1912); Marshall's *Explosives—Their Manufacture, Properties, Tests, and History* (1915).

**Fusible Metal**, any alloy which melts at a temperature below that of boiling water, and below the arithmetic mean of the temperatures of fusion of the component parts—a feature especially marked with certain alloys of bismuth. Such alloys expand on cooling, and thus take fine impressions of moulds. They are employed in electrotyping, in taking casts of medals and of wood cuts, and in the construction of automatic fire sprinklers.

**Fusiliers**, were formerly British foot soldiers armed with a lighter fusil or musket than the rest of the army; but all regiments now carry the same pattern of rifle. Fusilier is therefore simply an historical title borne by a few regiments of the British army.

**Fusion**. The fusion or melting of a solid substance means its change of aggregation from the solid to a liquid condition. Solidification or freezing is the exact converse of fusion, and the attending phenomena are essentially similar in each case. The term *liquefaction* is usually restricted to the condensation of a gas or vapor.

Fusion may be either crystalline or amorphous. In crystalline fusion, as in the case of ice, the change from solid to liquid occurs at a definite surface without any intermediate stage or plastic condition, and also at a definite temperature called the fusing or freezing point. Amorphous solidification, as in the case of alcohol and many organic liquids, takes place gradually without any definite freezing point or latent heat, and there is no sudden change of volume at any temperature. The melting point of ice is chosen as one of the convenient temperatures in the construction of a temperature scale (see THERMOMETER). The fact that the fusing or freezing point of a pure substance is constant affords a convenient test of its purity. See FREEZING; MELTING.

**Fusi-yama**. See **Fuji-yama**, **Fuji-san**, **Fuji-no-yama**.

**Fust**, or **Faust**, **Johann** (d. 1466), German printer, who entered into partnership with Johann Gutenberg in 1450, for which he supplied the funds and Gutenberg the printing apparatus. During the partnership with Gutenberg, *The Bible of 42 Lines* (1450-55), known also as the Gutenberg or Mazarin Bible, was produced. A folio edition of the *Psalter* (1457) was one of the most important works issued with Schöffer. See PRINTING.

**Fustel de Coulanges**, **Numa Denis** (1830-89), French historian, was born in Paris. His

first historical work, *La Cité Antique* (1864; Eng. trans.), which threw a flood of fresh light on the social and religious institutions of antiquity, made its author famous, and ultimately caused his appointment to a specially created chair at the Sorbonne. His principal production, *Histoires des Institutions Politiques de l'Ancienne France*, was completed and published in six volumes in 1892. Consult P. Guiraud's *Life*, in French.

**Fustian**, is a name given to certain kinds of heavy cotton fabrics, including moleskin, velvet, velveteen, beaverteen, corduroy, and other varieties. They are chiefly used for men's apparel, and are nearly all of the nature of velvet. See CORDUROY; VELVET.

**Fustic**, a name given to two distinct dyewoods, employed either for producing a yellow color, or for supplying the yellow portion of compound colors, as greens and browns.

**Fusulina**, a spindle-shaped, calcareous shell, sometimes half an inch in diameter, belonging to a genus of the group Foraminifera. In shape it somewhat resembles a grain of wheat, and when broken open it is seen to consist of many small chambers, which in the living condition are filled with protoplasm.

**Fusus**, a genus of gastropods, which are allied to the British whelk and American conch, and which include, in *F. colosseus*, perhaps the largest living gastropod. The shell is fusiform, with a many-whorled spire and a long, straight canal.

**Futa Jallon**, a mountainous region in the interior of French Guinea, West Africa, covering an area of about 42,500 sq. m., and having an altitude of from 4,000 to 5,000 ft. The climate is favorable, and the territory is rich in forests and gold. Timbo is the capital; Tuba and Labe are important towns. The original inhabitants were conquered by the Fulahs in the 16th century. A treaty of peace with France was signed in 1881, and the French protectorate was established in 1893; p. 700,000, mostly Fulahs.

**Futa-Toro**, or **Foota-Toro**, a fertile and level territory in the northern part of French Senegal, West Africa. It has tamarind forests, and exports pig iron; p. 120,000.

**Futchel**, a piece of wood placed lengthwise on a carriage frame to support the pole and splinter bar.

**Futtock**, nautical term applied to any of the curved timbers in the built-up frame of a wooden ship running outward from the floor or cross timber, and upward to the top timber.

**Future Estate**, in law, one created by will or deed to take effect after an interval. This

might seem as unobjectionable as an immediacy; but in fact, few transfers of property have been so jealously disfavored and restricted. First, even till the 19th century an 'estate' could be only of landed property, and only an estate could have divided or deferred interests; personal property or rights were allowed but one control, and an 'executory' addition to a life use had no force, and left the user sole owner.

In 1535-40 two forms of blank futures were legalized, the 'springing' and 'shifting' uses—springing into being or shifting to other grantees on certain contingencies. If made by will, these were called 'executory' devises, as not directly self-executing, but needing later executors. English law has not gone beyond these forms; American law is divided, some States retaining them, others allowing any kind of future for any kind of property; the only restriction being that against perpetuities—that it must not take effect beyond lives in being and 21 years 9 months extra. See ESTATES; PERPETUITIES, RULE AGAINST.

**Futurists**, the name adopted by the exponents of a revolutionary movement in art and literature, inaugurated about 1907 by F. T. Marinetti, a journalist of Milan, Italy. In painting, futurism manifests itself in an attempt to translate the idea of motion into plastic art. In poetry, it seeks freedom of expression through escape from the laws of rhyme and grammar.

**Fuzzy-wuzzies**, sobriquet applied by British troops to a Hamitic tribe of African nomads inhabiting the Eastern Sudan from the Abyssinian frontier to Suakin.

**Fyffe**, **Charles Alan** (1845-92), English historian, was born at Blackheath, London. He was the author of *History of Modern Europe* (3 vols., 1880-90), which was widely read.



*Fylfot.*

**Fylfot**, a pre-Christian form of cross, found on very ancient remains in Southern Europe. It has an immense range in both hemispheres, and is the *swastika* or *svastika* of the Buddhists and German Nazis. See CROSS; SWASTIKA.

**Fyne**, **Loch**, an arm of the Firth of Clyde, Scotland; runs in a north and northeast direction from Bute Sound for 40 m. through Argyllshire. Loch Fyne herrings are famous for their size and flavor.

**G.** The original sound of this letter is retained in such words as 'beg.' This is its value in scientific notation; it is a voiced k, or voiced back stop (see K). The sound in the modern English name, generally used before e, i, and y, is a compound = d + zh; it appears from the 14th century under old French influence. The simple sound zh occurs in some words (e.g. 'rouge') under modern French influence. G has also acquired these same values in Arabic. Gh usually represented spirant k, when that was an English sound. It has now become silent, as in 'plough,' or changed into f, as in 'laugh.'

Since the invention of printing, y, and occasionally z, have been substituted for G, because of their resemblance to one of its written forms. See consonantal Y. In form G is a modification of C (see ALPHABET), and that a rounding of —, and that a turning of the early Semitic form to the right. See SCALE.

**Gá** is the Old English form of the High German *gau*, which corresponds with a division of the country.

**Gabacho**, the Catalan designation of the natives of certain parts of the eastern Pyrenees; used also as a term of contempt for a Frenchman.

**Gabb, William More** (1839-78), American palæontologist, was born in Philadelphia. His knowledge of invertebrates during the cretaceous and tertiary ages gave him almost unrivalled rank with scientists. Among his publications are *Geological Survey of California* (1864); on the geology and topography of Santo Domingo (1873); and on the ethnology of Costa Rica, in the *Transactions of the American Philosophical Society*.

**Gabbro**, a massive, dark-colored, crystalline rock, similar in structure and texture to granite, but corresponding in composition to the basalts. It is the plutonic representative of the basic igneous rocks, and has formed by slow cooling at great depths. The minerals of gabbro are basic plagioclase feldspar, augite (diabase), and often olivine.

**Gabelle**, an oppressive tax on salt in pre-revolutionary France. Every individual over the age of seven years, not being a member of the privileged classes, was forced to buy a certain quantity of salt at the price fixed by the government. See E. P. Beaulieu's *Les Gabelles sous Louis XIV.* (1903).

**Gabelsberger, Franz Xaver** (1789-1849), inventor of the chief German system of shorthand, born at Munich. His system is generally adopted in German-speaking countries.

**Gaberlunzie**, or **Gaberlunzieman**, an old Scotch name for a strolling beggar or mendicant; also a king's bedesman, who was a licensed beggar. The class is well represented in Edie Ochiltree of Scott's *Antiquary*.

**Gabinus, Aulus**, tribune of the commons at ancient Rome in 67 B.C., when he carried a law conferring extraordinary power on Pompey for waging war against the pirates. He was consul in 58, and from 57 to 54 governor of Syria.

**Gabion**, an open cylinder made of brushwood, canvas, wire-netting, or iron bands, for use in fortification. Filled with loose earth, gabions are placed on end, in tiers, to form a wall, behind which earth can be piled at a steeper slope than it would naturally assume; and the whole becomes a rampart impervious to shell-fire.

**Gable**, that portion of the wall of a building which fills the triangular space formed by the junction of the roof-slopes.

**Gable, Clark** (1901- ), screen actor. was born in Cadiz, O. He made his film debut in *Dance, Fools, Dance*, soon becoming a leading motion picture star. His later pictures include *Strange Interlude*, *Men in White*, *Gone With the Wind*, and *Chained*. He won the Motion Picture Academy Award for fine acting in *It Happened One Night* in 1934.

**Gablonz, tn.**, Bohemia, Czecho-Slovakia, on the Neisse. One of the centers of the Bohemian glass industry; p. 38,589.

**Gaboriau, Emile** (1835-73), French au-

thor of detective stories, born at Saujon; became famous through his novel *L'Affaire Le-rouge*, which appeared in 1866.

**Gabriel**, the archangel who interprets the vision of Daniel and announces to Mary God's design to make her the mother of the Saviour. In the book of Daniel and in Luke, Gabriel is the revealing angel, and it is possibly this Jewish tradition which forms the basis of the Mohammedan conception of him as the revealer of the Koran. See **ARCHANGEL**.

**Gabriel's Insurrection**, an abortive insurrection of slaves in the vicinity of Richmond, Va., in 1800, instigated and planned by a slave named Gabriel, owned by one Thomas Prosser.

**Gad**, the seventh son of Jacob, by Zilpah, the handmaid of Leah, and the ancestor of the Israelite tribe of the same name. The name is borne by a seer at David's court, and also by an Aramaic and Phœnician deity. See **GILEAD**.

**Gadames**, **Ghadames**, or **Rhadames**, walled tn. and oasis, Tripoli, N. Africa, on the Tinghart plateau, 300 m. southwest of Tripoli. It is the ancient Cydamus, captured from the Garamantes by the younger Cornelius Balbus (c. 20 B.C.). Its population consists of Berbers, Arabs, and negro freedmen; p. 7,000.

**Gadara**, anc. tn., Syria, one of the Decapolis cities, e. of the Sea of Galilee. About 100 B.C. it was captured and partly destroyed by the Maccabæan prince Alexander Jannæus. The town was rebuilt by Pompey the Great in 63 B.C. About three miles to the n. are the hot springs of Amatha, much resorted to by the Bedouin.

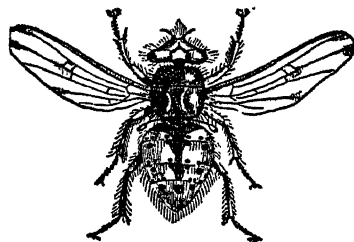
**Gaddi**, a family of Florentine painters. (1.) Gaddo Gaddi (1260-1332), born at Florence, summoned to Rome in 1308 by Clement v., executed a number of works in mosaic. Four frescoes at Assisi are said to be from his hand. (2.) Taddeo Gaddi (1300-66), born at Florence, son of the former, became a follower of Giotto. Among his works are a representation in fresco of the life of the Virgin, in the Santa Croce, Florence. (3.) Agnolo Gaddi (c. 1330-96), son of Taddeo, depicted the story of the holy girdle of the Virgin in fresco, in the chapel of the Holy Girdle at Prato.

**Gade**, **Niels Wilhelm** (1817-90), Danish musical composer, a native of Copenhagen; first attracted attention in 1841 by a collection of overtures, afterwards published as *Echoes of Ossian*. He founded the conservatoire at Copenhagen, with Hartmann, in

1865. His orchestral compositions, which represent his best work, include an overture, *Michael Angelo*, and eight symphonies. He also produced several compositions for strings and some pianoforte pieces, besides cantatas, such as the popular *Spring Message*, *Spring Fantasy*, *Psyche*, *The Erl-King's Daughter*. He was one of the originators of the modern Scandinavian school of music.

**Gades**. See **Cadiz**.

**Gadfly**, a name given in the United States to the large black, or blue-black, blood-sucking 'horseflies' of the family Tabanidæ, called in Great Britain clegs or breeze-flies. They are powerful in flight, and the females are furnished with a lancet-like proboscis which can pierce the thickest skin. They are present and dreaded by animals in nearly all parts of the world, and in Brazil are an even dangerous annoyance to man as well.



Gadfly.

**Gadidæ**, a family of bony fishes, to which belong cod, haddock, whiting, and other valuable food-fish. See the separate articles on these.

**Gadsden**, **Christopher** (1724-1805), American patriot, was born in Charleston, S. C. He was a member of the first Continental Congress in 1774, and urged the immediate expulsion of Gen. Gage from Boston. On the breaking out of the war he was promptly in the field, with the rank of colonel, and was soon promoted to brigadier-generalship. He was active in the military defence of South Carolina, but as its lieutenant-governor signed the surrender of Charleston to Sir Henry Clinton in 1780.

**Gadsden**, **James** (1788-1858), American soldier and diplomat, and grandson of Christopher Gadsden, was born in Charleston, S. C. He served for a short time as aid to John C. Calhoun in the War Department, but acquired his chief renown in 1853 as minister to Mexico. In this capacity he negotiated a treaty with the Mexican Government by which the U. S. acquired control of

a tract afterward organized into Arizona and New Mexico. For this tract, known as the 'Gadsden Purchase,' \$10,000,000 was to have been paid, but changes in the treaty and a Mexican revolution put off the settlement until after Gadsden was superseded.

**Gadsden Treaty**, a treaty between the U. S. and Mexico, signed Dec. 30, 1853, ratifications being exchanged on June 30, 1854. The negotiators were James Gadsden for the U. S., and Manuel Diez de Bonilla, José Salazar Ylarregui, and J. Mariano Monterde for Mexico. By this treaty the disputes, which grew out of the treaty of Guadalupe Hidalgo, concerning the boundary between the two countries, were settled, and the U. S. acquired an area of 45,535 sq. m.—an oblong square of land forming the southern part of what are now New Mexico and Arizona. By the treaty the U. S. was released from the onerous duty of protecting Mexico from Indian incursions and of restoring Mexican prisoners captured by Indians—the U. S. paying for this release and for the new territory \$10,000,000—and Mexico granted to the U. S. certain important privileges with regard to the transportation of mails and supplies across the Isthmus of Tehuantepec. For the text of the treaty see *Treaties and Conventions of the United States* (1889).

**Gads Hill**, in the village of Higham, Kent, England, was the scene of Prince Henry and Falstaff's robber escapades, depicted by Shakespeare in his drama of *Henry IV*. Charles Dickens died at Gads Hill Place in 1870.

**Gadwall** (*Chaulelasmus streperus*), a widely distributed duck, occurring throughout Europe and N. America, as well as in Asia and the n. of Africa. It is a freshwater species, and is remarkable for the great development of the comblike 'teeth' at the margin of the bill.

**Gæa**, or **Ge**, called **Tellus** by the Romans, the earth-goddess. She is said to have been the first offspring of Chaos, and she was the mother of Uranus (Heaven) and Pontus (Sea). Then she was wedded to Uranus, and bore to him the Titans.

**Gaelic Language and Literature**. Gaelic includes Irish and Manx as well as Scottish Gaelic, although in popular usage it is commonly restricted to the last. Gaelic joins with Greek in substituting *n* for the Aryan *m* as the termination of the accusative singular, the genitive plural, and the dative dual of nouns and adjectives; but its nearest relative in the Indo-European family is Latin. Celtic

presents several features in its structure which some scholars have attributed to external non-Aryan influences. At an early date the Gaelic branch lost the initial *p*. Again, Celtic has developed the habit of sounding two or more words, when they are closely connected grammatically, under one accent, and treating them, phonetically, as one word. Under this influence the prepositions and their pronominal objects have become permanently welded into one word. To the same cause are due other anomalies, notably the mutations known as initial aspiration and ellipsis, which students find so perplexing. A further feature, common in the Semitic languages, but in the Aryan family peculiar to Celtic, is that of placing two nouns, one of which governs the other in the genitive case, under one accent, and treating the combination as a compound noun; Cuchulainn, 'the hound of Culann.'

The language was brought to Argyll, Scotland, by the Dalriadic colony which settled there in the beginning of the 6th century, but it was in the district at a much earlier date. The language became the speech of Strathclyde and Pictland. Gaelic continued to be the language of the Scottish court until Malcolm Canmore's day (1057-93), but from that time it has been slowly receding n. and w. Of recent years a knowledge of English has penetrated into the remotest parts of the Highlands; but the old tongue is still spoken in corners of Aberdeen, Banff, Dumbarton, and Stirling, in considerable parts of Perth and Caithness, and over the whole of Arran, Argyll, Inverness, Ross, and Sutherland. It flourishes vigorously in parts of Canada, the only newspaper printed of recent years in Gaelic coming from Cape Breton.

The earliest Gaelic writings are found in Ireland, Wales, Devon, and Cornwall, cut on stone in the peculiar script known as Ogam. There is a continuous Gaelic literature from the 7th century. Much the greater part of this has been produced in Ireland. The Reformation effected a great cleavage between the Gaels of Scotland and the Gaels of Ireland in literature as in religion; but Scottish scholars continued to write in the old literary forms down to the middle of the 18th century, while, on the other hand, Duncan MacRae wrote the Fernaig ms. (1688-93) in the idiom of his native district of Kintail. In purely native literature there is a fairly full vocabulary, and a copy of the grammatical treatise compiled by the old Gaelic scholars.



The more important tales deal with the affairs of the Gaels themselves. These group round two centers—the first at the commencement of the Christian era, when Cuchullin is the great national hero; and the second in the 3d century, when Fionn MacCumhail is the principal figure.

Gaelic printed literature dates from 1567, when John Carsewell issued a translation of Knox's Liturgy. The genuine Ossianic ballads of manuscript and tradition were published in 1872 by J. F. Campbell in *Leabhar na Feinne*. The same author issued in 1860-2 his well-known *West Highland Tales*. By far the largest and most important section of modern Gaelic literature is what survives of the works of lyric poets who flourished from the 16th century to the present day. This body of verse is printed chiefly in the following collections: *The Book of the Dean of Lismore* (trans. by MacLauchlin, 1862); The Fernaig Collection—Cameron's *Reliquiae Celticae* (1894); R. Macdonald's (1776), Gillies's (1786), A. and D. Stewart's (1804), Turner's (1833), Mackenzie's *Beauties of Gaelic Poetry* (1841); Sinclair's *Gaelic Bards* (1890-6); and *An Duanair* (1879). With one exception, Mary Macleod, the works of the most highly prized Gaelic poets have been printed in separate volumes—as, for example, John Lom Macdonald, Alexander Macdonald, Dugald Buchanan, Robert Donn Mackay, Duncan Ban Macintyre, William Ross, Allan Macdougall, John Morrison, William Livingston, and Neil Macleod. Original Gaelic prose shows to great disadvantage, both in quantity and quality, in comparison with Gaelic poetry. Several Gaelic dictionaries of value have been published, the best being Armstrong's (1825), the Highland Society's (1828), and Macbain's Etymological Dictionary (1866). There are also a number of grammars, the most useful of which are Stewart's (1812), Munro's (1843), and Forbes's (1848). See Pattison's *Gaelic Bards* (1866), Blackie's *Language and Literature of the Scottish Highlands* (1876), M'Neill's *Literature of the Highlanders* (1898), and Maclean's *Literature of the Celts* (1902) and *Literature of the Highlands* (1904).

**Gaelic League**, an organization founded in Ireland in 1893 mainly by two eminent Gaelic scholars, Douglas Hyde and Father O'Growney, to promote the study of the Gaelic language and literature. Its work represents a literary trend and aspiration connected with the wider Nationalist movement in Ireland, but it is also concerned with the

renewal and encouragement of Gaelic studies in other countries. In 1898 the League extended its work to the United States and Canada. The visit and lectures of William Butler Yeats in 1903 and of Douglas Hyde in 1906 did much to increase American interest in Gaelic. Professorships in that language have been established in Harvard University, in the Catholic University of America at Washington, and in Notre Dame University, Indiana.

**Gætulia**, anciently the interior of N. Africa, lying to the s. of Mauritania and Numidia and the region s. of the Syrtes. Its inhabitants were of the Libyan race, the ancestors probably of the modern Berbers. The Gætulians were conquered by Rome in 6 A.D.

**Gaff**, a light fishing-spear with a fork or hook at the end used for landing fish. A sort of boom used in fore-and-aft rigged ships for extending the upper end of sails is also called a gaff.

**Gage, Frances Dana Barker** (1808-84). American reformer, daughter of Joseph Barker, born in Marietta, O., and married to J. D. Gage in 1829. She was among the first to organize women's rights conventions, and her opening speech at one in 1851 attracted wide notice. During the Civil War she was a faithful agent of the Sanitary Commission, and in South Carolina had permanent charge of a large camp of freedmen. Her children's stories by 'Aunt Fanny' attained wide popularity.

**Gage, Lyman Judson** (1836-1927), American financier, was born in Madison co., N. Y. He secured a clerkship at the Merchants' Loan and Trust Company. In 1868 he was appointed cashier of the First National Bank, in 1882 he was its vice-president, and in 1891 its president. His presidency of the World's Fair in 1892-93 brought him national reputation. He supported Cleveland's candidacy in 1884, but declined his offered appointment to be Secretary of the Treasury in 1892. He accepted that office from McKinley in 1897, and retained it under Roosevelt until 1902, when he resigned to accept the presidency of the United States Trust Company of New York.

**Gage, Thomas** (1721-87), English soldier and colonial governor of Mass., was born in Sussex, England. He was a lieutenant-colonel at the time of Braddock's expedition, during which engagement, although himself wounded, he contrived to rescue Braddock. After the English capture of Montreal, Gen. Amherst appointed him governor of that city.

In 1763 he was made commander of all the American forces, with headquarters at New York, where, in 1765, he surrendered on demand all the stamped paper. In 1772 he returned to England, but two years later he was ordered to Boston with four regiments to subdue the rebellious and discontented people of that colony. He threatened to punish severely the signers of the Solemn League and Covenant agreeing not to purchase British imports. His attempt to get possession of the arms and ammunition at Concord and Lexington 'fired the shot heard round the world.' In his report of the battle of Bunker Hill he confessed that 'the conquest of the country was not easy.' On its receipt in England, he was immediately recalled, and in 1782 was promoted to the rank of general.

**Gag-rules**, in American history, a series of rules adopted, between 1836 and 1844, by the House of Representatives, for the purpose of contravening the right of petition as regards slavery. This rule prescribed that petitions relating to slavery should thereafter be laid on the table without being printed or referred, and asserted that Congress had no power, under the Constitution, to interfere with slavery in the States, and should not interfere with slavery in the District of Columbia. This rule and its successors were adopted despite the First Amendment to the Constitution, which prescribed that 'Congress shall make no law . . . abridging . . . the right of the people peaceably to assemble and to petition the government for a redress of grievances.'

**Gahanbars**, the six season festivals of the Parsees; during which Ormazd created the sky, water, earth, plants, animals, and mankind.

**Gaillard, David du Bose** (1859-1913), American military engineer, was born in Fulton, S. C. He was engaged on various river and harbor improvements; was a member of the Panama Canal commission and supervising engineer of dredging in harbors, building breakwaters. He published *Wave Action in Relation to Engineering Structures* (1904).

**Gailor, Thomas Frank** (1856-1935), American Protestant Episcopal bishop, was born in Jackson, Miss., served as professor of ecclesiastical history, vice chancellor, and chancellor of the University of the South and in 1898 became bishop of Tennessee. From 1919 to 1925 he was presiding bishop of the American Protestant Episcopal Church. His

published works include *The Puritan Reaction* (1897); *The Episcopal Church* (1914).

**Gaines, Edmund Pendleton** (1777-1849), American soldier, was born in Culpepper co., Va. For his defence of Fort Erie (August, 1814), he was brevetted major general. In 1817 he took an active part in the first Seminole War in Florida, and in the second Seminole War (1836) he was severely wounded at Outhlacoocchie.

**Gaines' Mill, Battle of**, a battle fought about 8 miles northeast of Richmond, on June 27, 1862, during the Peninsular Campaign of the Civil War, between a part of General McClellan's Federal army and a part of General Lee's Confederate army.

**Gainesville**, city, Florida, county seat of Alachua co. Alachua Lake, Newnan's Lake and the Devil's Mill Hopper are features of scenic interest in the vicinity. The city was settled in 1856. It is the seat of the State University; p. 13,757.

**Gainsborough**, market town, England, in Lincolnshire, on the Trent, 15 miles northwest of Lincoln. Gainsborough, which is the St. Ogg's of George Eliot's *Mill on the Floss*, gives its title to the earldom in the Noel family; p. 19,694.

**Gainsborough, Thomas** (1727-88), one of the most famous of English portrait and landscape painters, was born in Sudbury, Suffolk. He settled in Ipswich, where he obtained work through Philip Thicknesse, governor of Landguard Fort, afterwards his first biographer. At his suggestion Gainsborough moved to Bath in 1760, and soon became a fashionable painter. He was one of the thirty-six original members (1768) of the Royal Academy; but being offended by the poor position given to his *Three Princesses* in 1784, he withdrew, and never exhibited again. In 1774 he left Bath, and settled in London.

Gainsborough was the rival of Reynolds in portraiture, and of Richard Wilson in landscape. He, more than any other artist, should be called the father of modern English painting. He painted more than three hundred canvasses, of which two hundred and twenty were portraits. Among his sitters were George III., Pitt, Burke, Clive, Garrick, Sheridan, Mrs. Siddons, and the Duchess of Devonshire. The portrait of the latter was exhibited in 1793, and was subsequently bought by Thomas Agnew and Sons for £10,065. In 1876 the canvas was cut from the frame in their galleries by a thief, but was recovered in the United States in April, 1901, and is now in the Metropolitan Museum,

New York. Two *Landscapes, Mr. Burroughs*, and a *Child with Cat*, are also in the Metropolitan Museum.



Gainsborough's Famous 'Duchess of Devonshire'.

(From the original sketch.)

**Gairdner, James** (1828-1912), British historian, was born in Edinburgh and began life as clerk in the Public Record Office in 1846. His publications include *The Paston Letters* (1872-5, 1900); *Henry VII.*, in the English Statesmen Series (1889); and *A History of the English Church in the 16th Century* (1902). He has edited a great part of the *Calendar of State Papers of Henry VIII's Reign*.

**Gaius**, Roman jurist, who lived during the reigns of Antoninus Pius and Marcus Aurelius

(138 to 182 A.D.), was the author of several works, all lost, except the *Institutes*; these were discovered by Niebuhr in 1816 at Verona.

**Galactagogues**, or **Galactogogues**, are agents which promote the secretion of milk.

**Galago**, the genus to which belong certain long-tailed lemurs, widely distributed throughout Africa.

**Galahad**, in the Arthurian romances, is the son of Lancelot and Elaine. In the later Grail romances he replaces Perceval as achiever of the quest of the Holy Grail. See **GRAIL** and **LANCELOT DU LAC**.

**Galapagos**, a group of about a dozen volcanic islands in the Pacific, 730 m. w. of Ecuador, to which they belong. The chief are Albemarle, James, Indefatigable, Narborough, Charles, and Chatham. Area, 2,400 sq. m. The flora and the fauna are alike peculiar. The fauna, differentiated in the different islands, especially prompted and furthered Darwin's problem of the origin of species. Confined to the islands is a huge tortoise (*Testudo elephantopus*). Turtles of enormous size frequent the coasts. Of the twenty-five kinds of land birds described by Darwin, all but one are peculiar; p. 400. See Darwin's *Voyage of the 'Beagle'* (1840-3), and Beebe's *Galapagos* (1923).

**Galashiels**, parl. bur. and tn., Selkirkshire, Scotland. The manufacture of Scotch tweeds, to which the town owes its prosperity, was introduced about 1829; p. (1901) 13,615.

**Galatea**. See **Acis**.

**Galathea**, a genus of decapod crustacea often called squat lobster. Several species occur on the northeastern Atlantic shores.

**Galatia**, anc. dist. of Asia Minor, consisting of parts of Phrygia and Cappadocia. It derived its name from the Galatæ, or Gauls, who invaded and settled in Asia Minor during the 3d century B.C. Augustus made Galatia a Roman province (see next article). The chief cities were Pessinus, Ancyra, and Tavium.

**Galatians, The Epistle to the**, one of the four greater epistles of Paul. The most probable date for the epistle assigns it to Paul's sojourn in Ephesus. Its purpose was to oppose the propaganda of certain Jewish agitators who had been trying, not without success, to undermine the reputation and work of Paul. We can name only a few of the almost innumerable commentaries: Hilgenfeld (1852), Lipsius (1892), James Moffat's *Introduction to the Literature of the New Testament* (1911).

**Galatina**, tn., prov. Lecce, Italy, 17 m. by rail s. of Lecce, with trade in oil, wine, and cotton; p. (1901) 14,086.

**Galatz** (Roum. *Galăți*), tn., river port, and episc. see, Roumania, in Covurlui co., on the l. bk. of the Danube. Here in 1789 the Turks defeated the Russians, and in 1828 the Russians the Turks. It was bombarded by the Germans in March, 1917, during the World War; p. 80,000.

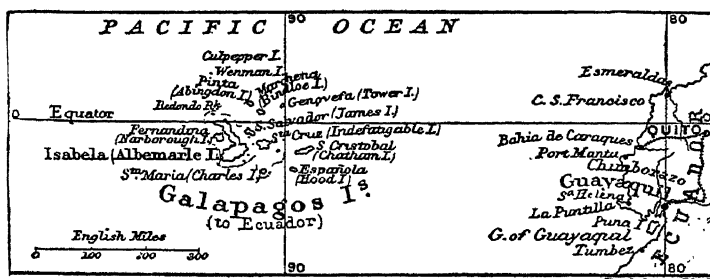
**Galax**, a one-species genus of plants belonging to the order Diapensiaceæ.

also of several plays, including *Miss Lulu Bett*, based on her novel of the same title, which was awarded the Pulitzer prize in 1920.

**Galeandra**, a genus of deciduous, terrestrial, tropical American orchids.

**Galega**, or **Goat's Rue**, a genus of hardy leguminous plants with white or blue papilionaceous flowers borne in racemes.

**Galen** (130 to about 200 A.D.), ancient physician, whose full name was Claudius Galenus; was born at Pergamos in Asia Minor. In 163 or 164 he went to Rome, and gained



*The Galapagos Islands.*

**Galaxia**, a genus of Cape bulbous plants belonging to the order Iridaceæ.

**Galaxy**, the Milky Way. One poetic legend identified it with the track of Phaethon; another with the ancient course of the sun, forsaken after the banquet of Thyestes. See MILKY WAY.

**Galba**, **Servius Sulpicius** (B.C. 3-69 A.D.), emperor of Rome from June, 68, to January, 69. He had a distinguished career under Tiberius, Caligula, Claudius, and Nero. After the murder of Nero he took the title of Cæsar and went to Rome.

**Galbanum**, a yellowish-brown gum resin yielded by *Ferula galbaniflua* and other umbelliferous plants. It is imported from Persia and the Levant in the form of tears or drops, and is used in medicine.

**Galcha**, a term applied by the Persians in a social sense to the primitive hill tribes of the Hindu-Kush, the Pamir, and the uplands stretching thence n. to the headwaters of the Syr Daria (Jaxartes). See *The Tribes of the Hindu Koosh* (1880); Ch. de Ujfalvy, *Les Aryens au Nord et au Sud de l'Hindou-Kouch* (1896).

**Gale**, **Zona** (1874-1938), American writer, born at Portage, Wisconsin. She was the author of many books, including *Friendship Village* (1908), *Birth* (1918), *Preface to Life* (1926), and *Old-Fashioned Tales* (1933);

great renown in that city. For many centuries his writings formed the chief text-book of the medical profession. He was especially distinguished in anatomy, diagnosis, and prognosis. For his principal contributions to medical science see MEDICINE. His most important anatomical and physiological works are *De Anatomicis Administrationibus*, and *De Usu Partium Corporis Humani*.

**Galena**, or **Lead-Glance**, the naturally occurring sulphide of lead, PbS, the source from which the metal lead is almost entirely obtained. See LEAD.

**Galena**, city, Illinois, county seat of Jo Daviess county, on the Galena River. Lead (galena) and zinc are extensively mined. Galena was the home of General Grant for several years prior to the Civil War; p. 4,126.

**Galeodes**, a genus of Solipugæ, an order of arachnids sometimes called 'false spiders' or 'scorpion spiders.' The species are abundant in hot countries, and are poisonous.

**Galeopithecus**, the generic name of certain mammals from the Malayan region, commonly, though incorrectly, called flying lemurs. The two species of *Galeopithecus* are now placed in a sub-order of Insectivora, and regarded as the vegetarian analogues of the insect-eating bats. Though incapable of true flight, they can take long flying leaps.

**Galeopsis**, a genus of hardy annual plants,

native to Europe, and naturalized in the United States.

**Galeotto Principe**, a name given to Boccaccio's *Decameron*.

**Galerius** (d. 311). Galerius Valerius Maximianus, a Roman emperor, was born of humble parentage, near Sardica, in Dacia. Entering the imperial army, he rose rapidly to the highest ranks. In 292 Diocletian conferred on him the title of Cæsar. On the abdication of Diocletian (305) he and Constantius Chlorus became joint-rulers of the Roman empire, Galerius taking the eastern half. He retained possession of the east till his death in 311. Galerius is believed to have forced Diocletian to issue his famous edict of persecution against the Christians.

**Gales, Joseph** (1786-1860), American journalist, was born in Eckington, England, son of a printer—also Joseph Gales (1760-1841)—whose democratic ideas forced his emigration to the United States in 1793. The younger Gales in 1812 formed a partnership with his brother-in-law, Seaton, for the publication of the *National Intelligencer* at Washington. Gales and Seaton for many years were the sole reporters of the debates in Congress, and to them the preservation of the famous debate between Webster and Hayne, with Webster's editing and correction, is due. The debates from 1798 to 1824 were published in forty-two volumes, entitled *The Annals of Congress*, and from 1824 to 1837 in twenty-nine volumes, entitled *Register of Debates in Congress*, popularly known as *Niles' Register*.

**Galesburg**, city, Illinois, county seat of Knox county. It is the seat of Knox College, founded in 1837, the scene of a famous debate between Lincoln and Douglas in 1850; and of Lombard College. The town was founded in 1836 by pioneers from New York and Vermont, led by Rev. George W. Gale, whose plan it was to found a college 'to spread the gospel throughout the world'; p. 28,876.

**Galiani, Fernando** (1728-87), Italian political economist, was born in Chieti, in the Abruzzi. He was educated in Naples, and in 1750 established a reputation both abroad and in his own country by his treatise *On Currency (Della Moneta)*. In 1759 he was appointed secretary of legation in Paris, and while there wrote his *Dialogues on the Corn Trade* (1770), which met with great success. Consult Alberto Margheri's *L'Abate Galiani* and Dessein's *Galiani et la Question au XVIIIe Siècle*.

**Galicia**, a former crown land of Austria, which was given to Poland by the Peace of

St. Germain in 1919. It is bounded on the n by Russian Poland, on the east by Russia, on the south by Hungary, from which it is separated by the Carpathians, and on the west by Prussian Silesia and Moravia. It was the largest of the Austrian crownlands, having an area of 30,307 sq. m. The surface is mountainous, with rolling plains towards the north, and is drained by the Vistula, Dniester, Pruth, Bug, and Sereth Rivers. The climate is temperate on the whole, with long severe winters and hot summers.

There is some mineral wealth, but agriculture is the chief industry, engaging more than three-fourths of the population. About one-fourth of the land is covered with forests, and timber is exported. The estimated population is about 7,488,930. Lemberg is the largest city. Other important towns are Cracow and Przemyśl. There are universities for higher education at Lemberg and at Cracow.

In the ninth century Ruthenia, which comprised Galicia and Lodomeria, with Kiev as its capital, rose to a position of great power. In the twelfth century, Kiev was destroyed by the Tartars and Russian refugees from that city settled in Galicia, which became one of the greatest of Russian principalities. In 1340 Poland acquired East Galicia with Lemberg, and Lithuania had the rest. Some forty years later Poland was united to the Lithuanian Empire, and until 1772 Galicia formed a part of that state. By the first partition of Poland, it was annexed to Austria.

In 1809 Napoleon made a treaty with Austria by which she ceded to him Western Galicia including Cracow and the southeast corner of Old Galicia. The Old Galician territory was given by him to Russia, and West Galicia and Cracow were added to the Duchy of Warsaw. East or Old Galicia was regained by Austria in 1814, and Cracow was annexed in 1846 and incorporated in Galicia.

During the Great War of Europe, Russian armies invaded Galicia, early in 1915, and gained the passes of the Carpathians but were driven out by Von Mackensen. The following year they returned to the attack and penetrated as far as Halicz; in July, 1917, fighting was once more resumed, in the vicinity of Lemberg, but the revolution which had taken place in Russia a few months earlier had so weakened the morale of the army that the Russian troops were soon routed and with the treaty of Brest-Litovsk, Russia's part in the war ceased. After the signing of the armistice in November, the Ukrainians and Poles entered upon a struggle for the possession of

Lemberg and Przemyśl. In August, 1919, Ukraine agreed to renounce her claims to East Galicia, but it was not until 1923 that East Galicia became an integral part of Poland and was recognized as such by the Council of Ambassadors. Since that time Poland has accorded her Ruthenian population a limited degree of self-government. See also POLAND; EUROPE, GREAT WAR OF.

**Galicia**, formerly a kingdom, later a province of Northwestern Spain, bounded on the north by the Bay of Biscay, on the east by Asturias and León, on the south by Portugal, and on the west by the Atlantic Ocean. It has an area of 11,256 sq. m., and has been divided since 1833 into the four provinces of Corunna, Pontevedra, Orense, and Lugo. Isolated peaks, hills, and valleys constitute the general topographic features and have won for the district the name of the Spanish Switzerland. On the coasts are some of the finest harbors in Europe, as Vigo and Ferrol. The climate is diversified and there is abundant rainfall which causes great humidity and a remarkably fertile soil.

Woods of oak and chestnut cover the hill-sides, and pines crown the mountain peaks; wheat, maize, rye and tobacco thrive in the valleys. The population numbers more than two millions. There were Phœnician colonies in Galicia in the twentieth century B.C., but the earliest documentary information concerning the region comes from the Romans. In 131 B.C. Brutus attempted its conquest. In 585 Leovigild, king of the Goths, made himself lord of the province. Gothic rule ended when the Saracens entered Spain in 709 and defeated Roderick the Visigoth. In the 10th century Alfonso III. achieved a temporary victory over the Moslems, and Galicia fell to his son Ordoño. On the death of Ferdinand the Great in 1065, it came into possession of his son Garcia; after long civil strife Garcia's brother Alfonso VI. annexed it to his domains and it became an integral part of the kingdom of Castile or of León.

**Galignani, John Anthony** (1796-1873), and **William** (1798-1882), French publishers of *Galignani's Messenger*, issued daily at Paris in English, were born in London, of Italian parentage. The *Messenger*, founded in Paris by their father in 1814, with the object of strengthening the ties between France and England, was carried on by the brothers after 1821.

**Galilee** (Galil, 'a ring or circle'). The Galilee of the Gentiles was a province in Palestine lying north of Samaria, with the valley of

the Jordan on the east and the Phœnician coast on the west. It included the Jordan valley, with the Lake of Galilee; the plain of Esdraelon in the south; Lower Galilee; and Upper Galilee. The soil in this region is exceedingly fertile; and olives, wheat, barley, maize, figs, melons, apricots, and pears are grown. The land was formerly extensively cultivated and was anciently a great thoroughfare: through it passed the *Way of the Sea*, from Damascus to the Mediterranean; the Great South Road, to Egypt; and the Great Road to the East, to Arabia.

Galilee of New Testament times was mainly inhabited by Syrians, Phœnicians, Arabs, and Greeks, with a few Jews. The principal towns were Tiberias and Sepphoris; those that figure in the gospels are Cana, Capernaum, Nazareth, and Nain. In modern times Galilee has formed part of the pashalic of Damascus. It still has a number of Jewish inhabitants. Consult Merrill's *Galilee in the Time of Christ*.

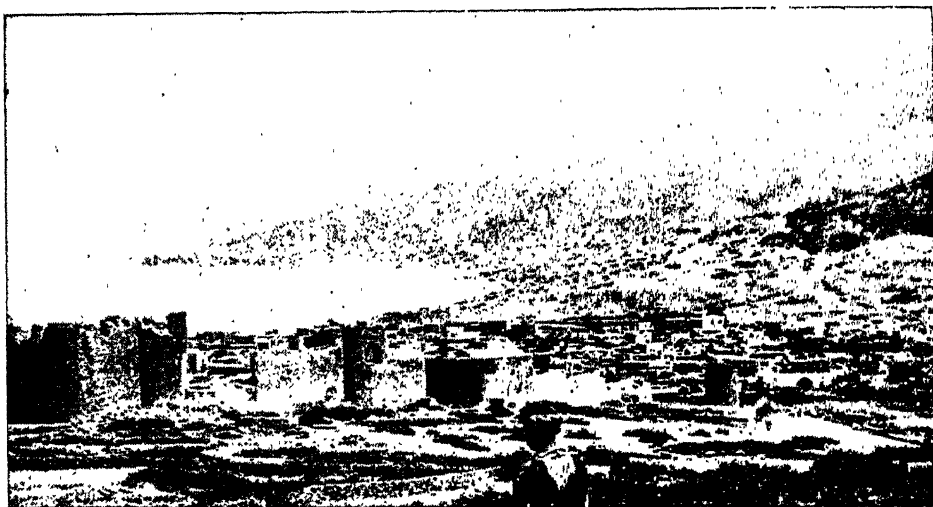
**Galilee**, in old English churches, a porch or external chapel used by persons not admitted to the church itself. Examples are to be seen at Durham, Ely, and Lincoln.

**Galilee, Lake of**, also known as the **Sea of Galilee**, **Sea of Tiberias**, and **Lake of Gennesaret**, a lake in Palestine, in the eastern part of the province of Galilee, closely associated with the life and ministry of Christ. It is about 13 m. long by 8 m. wide and is roughly harp-shaped. It occupies a trench 680 ft. below the level of the Mediterranean and is enclosed, except on the south, by high hills. To the south lies the deep valley of the River Jordan, which passes through the lake from north to south. During the life of Christ the Sea of Galilee was the focus for the whole province. There were at least nine cities around the Lake. To-day only the little town of Tiberias, with some 5,000 inhabitants, remains. Around the northern part of the Lake Christ passed the greater part of His public life and ministry. It was the scene of many of His miracles, as told in the Gospels, and from this region He took His disciples. Consult Smith's *Historical Geography of the Holy Land*; and Masterman's *Studies in Galilee*.

**Galilei, Galileo** (1564-1642), Italian astronomer and physicist, was born in Pisa, son of Vincenzo Galilei, a mathematician of some note. He entered the University of Pisa, and while a student there enunciated the law of vibrations or swings of a pendulum. In 1588 he secured a professorship in mathematics at the University of Pisa and while there propounded the theorem that all falling bodies

descend with equal velocity. This he proved by several experiments conducted from the top of the famous Leaning Tower. The hostility of the Aristotelians was aroused by such 'heresy,' and in 1591 Galileo quitted Pisa, and obtained the professorship of mathematics in Pauda University whither his lectures attracted pupils from all Europe. In 1609 he constructed a telescope, on the model of that of Hans Lippershey of Middleburg in Holland, and with it discovered four satellites of Jupiter, which he ascertained were not stationary, but actually revolved

by oath on his knees the truths of his scientific creed. Just before he became totally blind, in 1637, he made yet another important astronomical discovery, that of the moon's monthly and annual librations. He died Jan. 8, 1642, and was buried in the Cathedral of Santa Croce. An edition of his works and correspondence, including what is perhaps his most important production, *Dialogues of the New Sciences* (first pub. 1638), has been issued by the Italian government (1890-1909). Consult also *Lives* by Viviana, T. Henri Martin, Favaro, and Fabie.



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*The Sea of Galilee.*

In the foreground is the little town of Tiberias, the only one of the great lake cities remaining today.

around the planet. He also demonstrated the uneven configuration of the surface of the moon, and he detected sun-spots, from which he inferred the rotation of the sun.

In 1610 Galileo was invited to Florence by his patron, Cosimo, Grand Duke of Tuscany, and established as his philosopher and mathematician. Continued advocacy of Copernican principles brought him under the ban of the church, and the Holy Office bade him discontinue his teaching; at the same time, Copernicus' book on the subject was interdicted. Galileo promised to obey this injunction, but in 1632, ignoring his pledge, he published the *Dialogo sopra i due massimi Sistemi del Mondo*. Galileo was again summoned before the Inquisition, and, after a wearisome trial and incarceration, was condemned to abjure

**Galitzin**, also **Gallitzin**, **Golizyn**, and **Galizyn**, a prominent family of the Russian nobility. Among the most important were: VASIL VASILJEVITCH, surnamed 'the Great' (1643-1713), was head of the army and keeper of the great seal under Sophia, sister of Peter the Great. MICHAEL MICHAELOVITCH (1674-1730), won distinction in the wars of Peter the Great against Turkey and Sweden, and especially by the conquest of Finland (1714). DIMITRI ALEXEJEVITCH (1735-1803) served as Russian ambassador to The Hague and Paris. He is most widely known through his wife ADELHEID AMALIE (1748-1806), who gathered, at various times, Goethe, Jacobi, Fürstenberg, Hemsterhuis, and Hamann in her house at Münster, where she settled after separating from her husband. NIKOLAI SERGEE-

VITCH (1808-92) was lieutenant-general in the Russian army, and wrote a history of war, and other historical works. For Demetrius Augustin Galitzin, see GALLITZIN.

**Galium**, popularly known as Bedstraw, a genus of hardy plants having four-angled stems and bearing cymes or panicles of small flowers. See BEDSTRAW.

**Gall, or Gallus, St.** (A.D. 551-646), a saint of Irish origin, often called 'the apostle of the Alemanni.' He was a pupil of St. Columban at Bangor in Ireland; then settled in Switzerland near Lake Constance. The Swiss canton and town of St. Gall take their name from him.

**Gall, Franz Joseph** (1758-1828), German physiologist and founder of phrenology, was born near Pforzheim in Baden. Having established himself as a physician in Vienna (1785), he began his phrenological researches, presenting the results of his studies in a series of lectures. The ultimate value of Gall's phrenological ideas is slight, but his books were useful in directing scientific attention to the brain and its functions. Consult *Life* by Jessie Fowler.

**Gallait, Louis** (1810-87), Belgian painter, was born in Tournai, and first achieved fame through his pictures, *Render unto Cæsar the Things which are Cæsar's* (1832) and *Christ Healing a Blind Man* (1833). He afterwards achieved a notable success in Paris as a historical and portrait painter. His *Minstrel Boy* and *The Prisoner* are in the Metropolitan Museum, New York City.

**Galland, Antoine** (1646-1715), French orientalist and archæologist, was born in Riolot (Picardy). He made several expeditions to the East and in 1704-17 published *Les Mille et une nuits*, the first European translation of the Arabian Nights, which remains the standard French version. Among his other works is *Paroles remarquables, bons mots et maximes des orientaux* (1694).

**Galla Ox, or Sunga** (*Bos indicus*), a species of humped cattle found in Central Africa. It has exceedingly thick horns and a hump on the withers such as is seen in all the domesticated cattle of India, China, Africa, and Madagascar.

**Gallas**, an Ethiopian people of Eastern Africa, ranging from Abyssinia in the north to the Tana River in the south. They are a pastoral people, but somewhat warlike owing to their environment. The total number of Gallas is estimated by Krapf at from six to eight millions.

**Gallas, Matthias, Count** (1584-1647),

Austrian general in the Thirty Years' War, was born in Trent in Tyrol. At Nördlingen (1634) he inflicted a crushing defeat on Duke Bernhard of Saxe-Weimar, and restored to the emperor a preponderating influence in Germany. In 1637 he drove the Swedes under Banér back to Pomerania, but in 1634 he unsuccessfully opposed Torstensson.

**Gallatin, Albert** (1761-1849), eminent American statesman and financier, was born in Geneva, Switzerland, on Jan. 29, 1761. In 1780, he emigrated to the United States and taught French in Boston and in Harvard College (1781-2). He entered politics in Pennsylvania as an anti-Federalist; in 1789-90 he was a member of the State constitutional convention, and in 1790-2 he was a member of the lower house of the State legislature. In 1793 he was elected by the votes of both Republicans and Federalists to the U. S. Senate. He had served for only three months, however, when his election was declared void by a strict party vote. After leaving the Senate, Gallatin was again conspicuous in agitation against the whiskey tax, though he was relatively conservative and exerted himself to prevent violence and bloodshed. (See WHISKEY INSURRECTION.) From 1795 to 1801 he was a member of the Federal House of Representatives. He was from 1801 to 1814 Secretary of the Treasury in the cabinets of Presidents Jefferson and Madison, and his services during the trying period of the War of 1812 placed him in the foremost rank of America's public financiers. When Russia offered her mediation to the United States and Great Britain, Gallatin went to Russia (May 1813) as a special commissioner (though he retained his portfolio until February, 1814). When Russian mediation failed, he became one of the American peace commissioners who, with the commissioners of Great Britain, negotiated the treaty of Ghent, closing the war (see GHENT, TREATY OF). He then assisted in negotiating a special commercial convention with Great Britain in 1815, and from 1816 to 1823 was U. S. minister to France. In 1826-7 he was U. S. minister to Great Britain, and on his return he settled in New York, where from 1829 to 1839 he was president of the National Bank of New York.

Gallatin spent much of his later life in reading and study, showing an especial interest in American ethnology, of which science he has been called the founder. He published in 1836 a *Synopsis of the Indian Tribes within the United States East of the Rocky Mountains and in the British and Russian Possessions in*



*North America*, which still remains a valuable work. He died at Astoria, Long Island, on Aug. 12, 1849. Consult *The Writings of Albert Gallatin*, edited by Henry Adams (3 vols., 1879); Adams' *The Life of Albert Gallatin*; Stevens' *Albert Gallatin* in the 'American Statesmen Series.'

**Gallaudet, Edward Miner** (1837-1917), American educator of deaf-mutes. In 1856 he began work as an instructor in the American Asylum for the Deaf at Hartford, and in the following year, with his mother, herself a deaf-mute, who had been one of his father's pupils, established the Columbian Institution for the Deaf at Washington, D. C. Seven years later he helped to organize the National Deaf-Mute College in the same city. He published *A Popular Manual of International Law* (1879), and a *Life of Thomas Hopkins Gallaudet* (1888).

**Gallaudet, Thomas** (1822-1902), American clergyman and teacher of deaf-mutes, was born in Hartford, Conn. Having been ordained a priest of the Protestant-Episcopal Church, he established, in New York, St. Ann's Episcopal Church (1852) for deaf-mutes, and in 1885 founded the Gallaudet Home for Deaf-Mutes near Poughkeepsie, N. Y.

**Gallaudet, Thomas Hopkins** (1787-1851), American teacher of deaf-mutes, was born in Philadelphia. He opened at Hartford (April, 1817) the school which in a few years developed into the American Asylum for the Deaf. Of this institution he was principal until 1830. His sons Thomas and Edward were both active in work on behalf of the deaf. Consult *Life* by E. M. Gallaudet.

**Gallaudet College**, an institution for the higher education of deaf-mutes, in Washington, D. C., inaugurated in 1865 as the National Deaf-Mute College, and renamed Gallaudet College in 1894, in honor of Thomas H. Gallaudet. The first president was Edward M. Gallaudet who held office until 1910. For latest statistics see Table of Universities and Colleges under the heading UNIVERSITY.

**Gall-bladder**, a membranous sac for the temporary storage of bile, situated in a depression on the under side of the liver. It is approximately pear-shaped, about 4 in. long and an inch in breadth at its widest part. It is connected by the cystic duct with the hepatic duct, the two forming the common bile duct which empties into the intestinal tract. Infection of the gall-bladder is known as cholecystitis. The most common affection of the gall-bladder is cholelithiasis, or gall-stones. See also LIVER.

**Galle** (formerly **Point De Galle**), sea-

port, Ceylon, on the southwestern coast; 66 m. southeast of Colombo. It was for long the chief port of the island; p. 39,073.

**Galle, Johann Gottfried** (1812-1910), German astronomer, was born near Wittenburg. His observations included the actual discovery (Sept. 23, 1846) of the planet Neptune, whose existence had been asserted by Leverrier, and of three comets. He contributed, also, to meteorological research.

**Gallego**, the Spanish name for the cold piercing north and northwest wind that blows from Galicia. The name is also applied to the natives of Galicia.

**Gallenga, Antonio Carlo Napoleone** (1810-95), Italian historian and publicist, whose earlier works appeared under the pseudonym Luigi Mariotti, was born in Parma. He visited the United States, Spain and England and was correspondent of the *London Times* from 1859 to 1883, serving in Austria, the United States, Spain, Cuba, and Constantinople. Among his published works, written in English, of which he was a master, are *History of Piedmont* (1855); *Country Life in Piedmont* (1858); *Italy Revisited* (1875); *The Pope and the King* (1879); *Italy, Present and Future* (1887).

**Galleon**, a name formerly given to Spanish ships of war with three or four batteries of cannon, and later applied to the large Spanish merchant ships, usually with four decks.

**Gallery**, an architectural term originally used of long corridors connecting two portions of a building. As these were often adorned with pictures, the term came to be applied to any room in which pictures were hung. In Gothic architecture the term gallery denotes the division into stories of the façades of a church, marked by balustrades or arcades. Balconies running around the tops of auditoriums and on the outside of houses, are also called galleries.

**Galley**, a low, flat vessel equipped with oars and sails, in ancient times the common type of both merchant and war craft. In order to attain the greatest possible speed, the number of oars was increased from a single tier to three, as in the trireme, or even to five or six. In the Middle Ages the galley was the war ship of the Mediterranean countries. It was generally a long, narrow, one-decked vessel carrying several hundred men, lateen-rigged, and propelled by from twenty to thirty oars on a side. The rowers were usually prisoners and felons, six or seven to each oar, and the galleys were heavily armed.

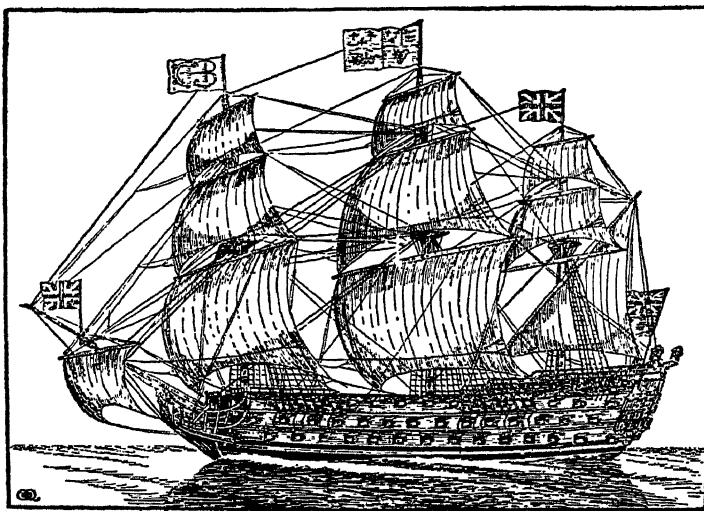
**Gall Flies**, a name applied to certain mem-

bers of the family Cynipidæ, of the order Hymenoptera, to whose activities the galls, seen in certain plants are due. Not all members of the family, however, produce galls, and some galls are produced by other agencies (see GALL MIDGES). Consult Howard's *The Insect Book*.

**Gallia**, in ancient times, the country inhabited by the Gauls. It embraced two regions—Gallia Cisalpina or Citerior, and Gallia Transalpina or Ulterior. The latter, the real home of the Gauls, included all of modern

in the form of white, silky, astringent needles, soluble in water, giving an acid solution which precipitates ferric salts but not gelatin. It is a powerful reducing agent, forms numerous gallates, and when heated to 215° C. yields pyrogallol.

**Gallicanism**, an attitude prevalent in the Roman Catholic Church of France, especially during the seventeenth and eighteenth centuries. In the fourteenth century the conflict between Gallican principles and the papal



*Galleon*

France and Belgium and parts of Holland, Germany, and Switzerland. The Romans began the conquest of Gaul about 125 B.C., and in 121 the south of Gaul was made into a Roman province known as Provincia (hence the modern Provence). Between 58 and 50 B.C. Julius Cæsar conquered the rest of Gaul, which was then divided into three parts—*Aquitania*, between the Pyrenees and Garonne; *Celtica*, between the Garonne and Seine; and *Belgia*, north of the Seine. Gallia Cisalpina was the name given to the north of Italy, between the Apennines and the Alps. Consult Holmes' *Cæsar's Conquest of Gaul*.

**Galliard**, a dance tune; also a dance for two persons, common in the 16th and 17th centuries. It is said to have been the forerunner of the minuet.

**Gallic Acid**, one of the six possible trihydroxybenzoic acids,  $C_6H_3(OH)_3COOH$ , a constituent of gall-nuts, sumach, divi-divi, etc. It can be prepared by boiling its glucoside, tannin, with dilute acids, and is obtained

sec became acute. A bold stand against the papacy was taken in the Pragmatic Sanction of Bourges in 1438 and in 1682 'four propositions or declarations of the French clergy,' drawn up by Bossuet, were signed at Paris. The propositions were (1) kings and princes are not subject to the ecclesiastical power in temporal affairs, and cannot be deposed by it; (2) the Pope's power is limited by the decisions of general ecumenical councils as well as (3) by the canons of the universal church, and the rules, customs, and institutions of the French kingdom and church; (4) the Pope's judgment in matters of faith is not final unless it is supported by the whole church. These declarations were successively condemned, between 1690 and 1800, by Alexander VIII., Clement XI., and Pius VI. Pius VII. was compelled to sign the Concordat of Fontainebleau, which did not recognize his right to institute bishops. The Vatican Council of 1869 condemned three of the four declarations, and since that time Gallicanism has steadily de-

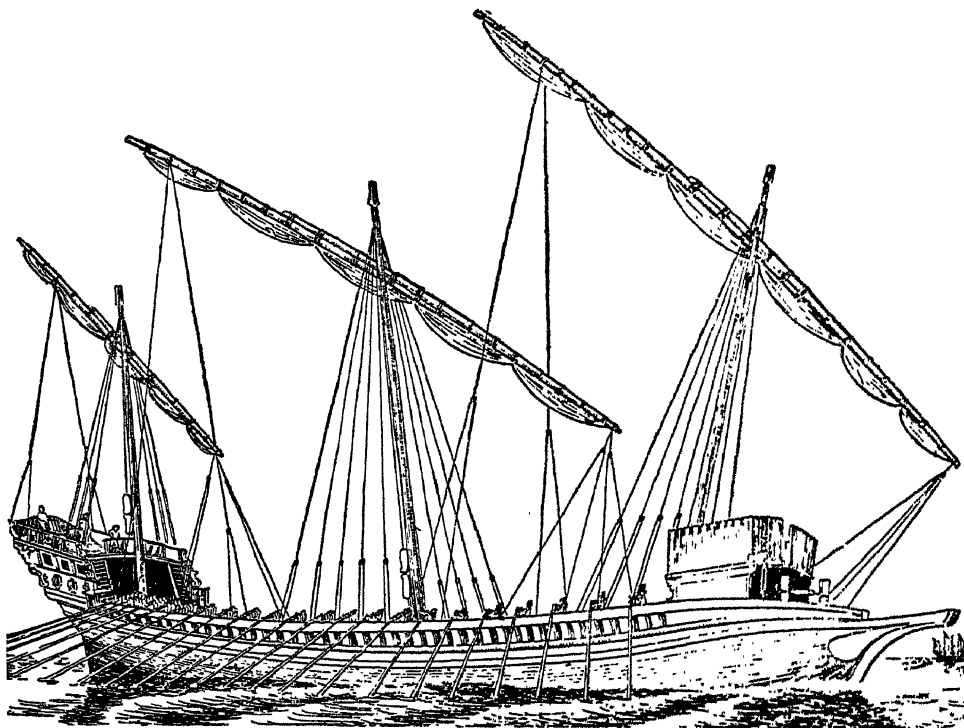
clined. Consult Jervis' *History of the Church of France* and *The Gallican Church in the Revolution*.

**Galli-Curci, Amelita** (1889- ), Italian coloratura soprano, was born in Milan, Italy. She studied piano at the Royal Conservatory, and upon her graduation in 1908 was appointed professor in that institution. As a vocalist she is self taught. Her first appearance with the Metropolitan Opera Company, New York City, took place in 1921 as

tured by the Persians, Gallienus became emperor, and reigned until 268 A.D.

**Galliffet, Gaston Alexandre Auguste de, Marquis de** (1830-1909), French general, was born in Paris. He became minister of war in June 1899, and carried the government safely through the Dreyfus crisis. Consult his *Mes Souvenirs*.

**Gallinaceous Birds**, or Gallinaceæ, a large order of birds. They have usually a small head, short bill, large crop, and short



Galley.

Violetta in *La Traviata*. She was married in 1910 to the Marquis Luigi Curci, and in 1921 to Homer Samuels, an American. Mme. Galli-Curci is an American citizen.

**Gallieni, Joseph Simon** (1849-1916), French soldier and colonial official, was born in Saint-Béat (dep. Haute-Garonne). In 1896 he became governor-general of the new French colony of Madagascar. In the early days of the Great War Gallieni was appointed military governor of Paris. He became Minister of War in 1915.

**Gallienus, Publius Licinius Valerianus Equatius**. In 260, when Valerian was cap-

wings. The feet are adapted for walking and for scratching. The plumage of the males is often brilliant and beautiful.

**Gallinger, Jacob H.** (1837-1918), American public official, was born in Cornwall, Ontario, of American ancestors. In 1872 he was elected a member of the New Hampshire House of Representatives; and was elected to Congress in 1885 and 1887. In 1891 he was elected to the United States Senate, being re-elected in 1897, 1903, 1909, and 1915.

**Gallinule**, a water-bird allied to the rails and coots, several species of which inhabit marshes in North and South America and in

the Old World. They are known everywhere as 'water hens' and 'mud hens,' and are usually shot for sport, although the flesh is edible.

**Galliot**, a Dutch vessel generally used for fishing, carrying a mainmast and a mizzenmast, and a large gaff-mainsail. Also a small galley, a kind of brigantine, built for pursuit, and propelled by both sails and oars.

**Gallipoli**, peninsula, European Turkey; a narrow tongue of land, some fifty m. long and varying in width from two or three to twelve m., separating the Dardanelles from the Gulf of Xeros. It consists of a mass of steep, rocky ridges rising more than 700 ft. from the sea. On the east coast, at the head of the Dardanelles, is the town of Gallipoli. It has interesting mediæval ruins. In the Great War the peninsula was the scene of the disastrous Dardanelles campaign.

**Gallitzin, Demetrius Augustin, Prince** (1770-1841), Russo-American clergyman, was born in The Hague, Holland, where his father was Russian ambassador. He became a Roman Catholic in 1787, and in 1792 was sent by his parents to America, where he entered the priesthood, secured a large tract of land at Loretto, Pa., and there established a Roman Catholic church and colony, which became the parent of colonies in other parts of Pennsylvania. He wrote much on controversial subjects.

**Gallium** (Ga. 70.1), a rare metal, discovered spectroscopically in 1875 by Lecoq de Boisbaudran, in the zinc blende of Pierrefitte, Hautes-Pyrénées. It is a hard, grayish-white metal, the only metallic element, besides mercury, which can be liquid at ordinary temperatures.

**Gall Midges**, or **Gall Gnats**, minute flies belonging to the order Cecidomyiidae. They feed upon plant tissues, most of them producing galls. The species of greatest economic importance is the Hessian fly, which in the larval state lives in the stems of wheat, doing great damage to the crop.

**Gallon**, a measure of capacity containing four quarts. The U. S. gallon is defined as a volume of 231 cubic inches.

**Galloway**, ancient district, in the s.w. of Scotland, now comprising the shires of Kirkcudbright and Wigtown.

**Galloway, Mull of**, a rocky promontory in Wigtownshire, Scotland, forming the southern extremity of the peninsula known as the Rhinns of Galloway. It is a mile and a quarter long and a quarter of a mile broad, with almost perpendicular sides. It contains many

caves accessible only from the sea. Remains of Scandinavian defences and the chapel of St. Medan, in the construction of which a natural cave was used, are of interest.

**Galloway, Beverly Thomas** (1863-1938), American botanist, was born in Millersburg, Mo. In 1913-14 he served as Assistant Secretary of Agriculture, and in 1914-16 was dean of the New York State College of Agriculture, Cornell University. In 1916 he became pathologist in the Office of Seed and Plant Introduction of the U. S. Department of Agriculture.

**Galloway, Joseph** (1731-1803), American lawyer and loyalist, was born in Kent county, Maryland, and began his career as a lawyer in Philadelphia, where he became an intimate friend of Franklin. In the colonial struggle his sympathies were with the English monarchy, and as a member of the Continental Congress he exerted himself in behalf of modifying opposition to the crown. He signed the Articles of Association in favor of the 'non-importation, non-consumption, and non-exportation' of articles between Great Britain and her colonies, and proposed a plan of government known as the 'Plan of a Proposed Union.' Although urged by Franklin to cast his lot with the advocates of independence, Galloway joined General Howe, and aided him in his march to Philadelphia with advice and information. After the capture of that city, he was made superintendent of the port and of the police. After its evacuation he retired to England and the Pennsylvania Assembly confiscated for high treason his estates. Notwithstanding Howe's previous friendship for him, Galloway appeared before Parliament as an accusatory witness of the general's incompetency. Among his publications are: *A Candid Examination of the Mutual Claims of Great Britain and the Colonies* (1775); *Cool Thoughts on the Consequences to Great Britain of American Independence* (1780); *The Claim of American Loyalists Reviewed and Maintained upon Incontrovertible Principles of Law and Justice* (1788).

**Galls**, abnormally altered, usually hypertrophied plant tissue-bodies, due commonly to the activity either of insects or parasitic fungi. Those in which an insect pierces the plant and deposits its eggs in the substance, and not on the surface, thus causing the tissue to hypertrophy in such a way that the wound occupies the centre of the resulting sphere, are known as 'solid or tuberculous galls'—as oak-apples and the bedeguars of the wild rose.

Galls produced by parasitic fungi are usually caused by the excreta of the plant; common examples of such galls are the tumors and wens found on the leaves and stems of organisms infested by parasites.



Gall

**Gall-stones**, or **Biliary Calculi**, pathological concretions derived from the bile, giving rise to the condition known as cholelithiasis. They are almost invariably formed in the gall-bladder, although in a few cases they appear to originate in the biliary ducts. They may be single, attaining a large size, or small and numerous.

**Gallup**, town, New Mexico. Coal is mined nearby, and there are productive oil wells and extensive deposits of fire-clay. It is a large market for Navajo blankets; p. 7,041.

**Gallup, George Horace** (1901- ), public opinion statistician, was born in Jefferson, Ia. He founded and is director of the American Institute of Public Opinion. He has taught journalism in Drake, Northwestern, and Columbia Universities and has written *The Pulse of Democracy* and *A New Technique for Measuring Reader Interest*.

**Gallus, Caius Cornelius** (c. 66-26 B.C.), Roman poet and statesman, friend of Virgil and Ovid. None of his writings remain.

**Gallus, Caius Vibius Trebonianus**, Roman emperor (251-253 or 254 A.D.), is said to have contributed by his treachery to the defeat in which the emperors Decius and Herennius fell. He was made emperor by the soldiers, Nov. 251, and concluded a disgraceful peace with the Goths. He and his son were slain by their own troops.

**Gally, Merritt** (1838-1916), American inventor, was born in Perry, N. Y. Among his most important inventions are the Universal job printing press, a linotype machine, a multiple telegraph system, and mechanism for relays and repeaters in telephones.

**Galois, Evariste** (1811-32), French mathematician. He published several papers on the theory of equations and the theory of numbers. The fundamental ideas, later elucidated,

profoundly influenced mathematical philosophy.

**Galsworthy, John** (1867-1933), British novelist and dramatist, was born in Coombe, Surrey. He was educated at Harrow and Oxford, studied law, and in 1890 was called to the bar, but devoted himself almost entirely to literary work. His earliest novel, *Jocelyn*, was published in 1898. With the publication of *The Island Pharisees*, in 1904, the author's reputation was assured. *The Man of Property* (1906) was the first of a famous sequence of novels later to be known as *The Forsyte Saga*. In his picture of the Forsytes, he gave in detail the whole background and ideals of English upper middle class society. After the Great War he continued this portrayal, starting with *The White Monkey* and through *One More River*, his last novel, endeavoring to follow the changing ideals of post war England. Among other works along these lines are: *The Silver Spoon* (1926), *Swan Song* (1928). In his short stories he attained distinction with *Caravan* (1925), a collection; but probably his greatest popularity was due to his plays. These are marked by his ability to display the opposing points of view in society today with their ensuing conflicts and dramas. Among them the best known probably are: *The Silver Box* (1906); *Justice* (1910); *The Skin Game* (1920); *Loyalties* (1922); *Old English* (1924).

**Galt, Sir Alexander Tilloch** (1817-93), Canadian statesman, was born in Chelsea, London, son of John Galt. He was the first finance minister of the Dominion (1867), and its high commissioner to England (1880-3). He also served on a number of commissions, notably the Washington Treaty (1870).

**Galt, John** (1779-1839), Scottish novelist, was born in Irvine, Ayrshire, and in 1806 settled in London. His first really successful work, *The Ayrshire Legatees*, appeared in 1820, and was followed in 1821 by his masterpiece, *The Annals of the Parish*. In 1833 appeared his *Autobiography*, and in 1834 his *Literary Life and Miscellanies*. His best novels, besides those mentioned above, are *The Entail* (1824), *The Provost* (1822), *Sir Andrew Wylie* (1822), and *Larrie Todd* (1830), this last containing vivid sketches of frontier life in the United States.

**Galt, Sir Thomas** (1815-1901), Canadian jurist, son of John Galt, removed with his father to Canada. He became chief justice of the Court of Common Pleas in 1887.

**Galton, Sir Francis** (1822-1911), British anthropologist, cousin of Charles Darwin, was

born in Birmingham. He published an interesting account of his travels and discoveries entitled *Tropical South Africa*, followed by *The Art of Travel*. In 1863 appeared his *Meteorographica, or Methods of Mapping the Weather*, the basis of the system of weather forecasting now in general operation, and in 1869 *Hereditary Genius*, the result of the researches into the laws of heredity with which his name is chiefly associated. In 1884-5 he initiated an anthropometric laboratory in connection with the International Health Exhibition, including among the data collected impressions of finger prints, a means of identification now used in almost all criminal investigations. He also devised the method of composite photographs, made important contributions to psychology, and founded the science of eugenics. Besides the works already mentioned, he published *English Men of Science* (1874); *Inquiries into Human Faculty* (1883); *Natural Inheritance* (1889); *Finger Prints* (1893); *Finger Print Directory* (1895); *Memoirs of My Life* (1908).

**Galtonia**, a genus of South African, hardy, liliaceous plants, of which the sweet-scented, white-flowered *G. candicans*, the summer hyacinth, is most familiar in gardens.

**Galvani, Luigi** (1737-98), Italian physiologist and anatomist. He studied medicine under the distinguished physician Galeazzi, whose daughter he married, and in 1762 became professor of anatomy in the University of Bologna. It was purely by accident, so it is said, that he discovered the phenomenon of galvanic activity. His wife, having noted the convulsive twitching produced in the leg of a skinned frog following contact of the crural nerve with the point of a scalpel charged with electricity, called the fact to his attention. Galvani thereupon instituted a long series of experiments, as a result of which he published in 1791 his treatise *De Viribus Electricitatis in Motu Musculari*.

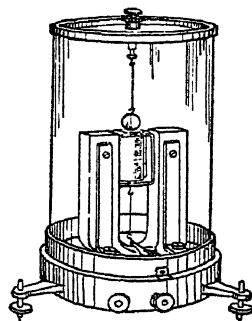
**Galvanic Battery.** See **Electric Battery.**

**Galvanizing**, the process of coating iron and steel products with zinc to prevent rusting. The oldest galvanizing process and the one most generally used is the hot or dipping process. The iron is first carefully cleaned by pickling with acid and scouring with sand. It is then dipped in a bath of molten zinc covered with a sal ammoniac flux to prevent adhesion. Cold or electro-galvanizing is a process of zincking by electro-deposition from a bath containing salts of zinc and alumina. It is suitable for springs, wire netting, screws,

bolts, nuts, and machine parts having threads and perforations.

Galvanized tinware, so-called, is merely galvanized ironware which has received a thin deposit of tin before the zinc has been applied. In this way a particularly uniform coating of zinc is obtained. Consult Flanders' *Galvanizing and Tinning* (1922).

**Galvanometers**, instruments constructed for the purpose of detecting the existence of electric currents, or of measuring their strength. For the first purpose in much experimental work a coil consisting of several turns of well insulated copper wire, with a small magnet suspended at its center, and provided with a pointer, is quite sufficient. This is adjusted so that the axis of the magnet lies in the center of the plane of the coil, and



*D'Arsonval Galvanometer.*

whenever a current passes round the coil the magnet is deflected from its original position. For measuring the strength of the current there are two possible arrangements of the coil and magnet: (1) The coil is fixed and the magnet movable; (2) the coil is movable and the magnet fixed.

The D'Arsonval galvanometer is the most common form of moving-coil type. A coil of wire is suspended between the poles of a permanent horseshoe magnet. When a current is sent through the coil, the magnetic field set up reacts with the magnet field of the fixed magnet, and the coil turns to the right or left depending on which way the current is flowing in the coil. The current is led gradually into the coil through the suspension; perhaps this might be a thin narrow strip of phosphor-bronze. The current then leaves at the bottom of this instrument by way of a fine brass spring which is also used to turn the coil back to its starting position after the current has stopped.

**Galveston**, city, Texas, county seat of Galveston co., is situated on Galveston Bay. It has steamship communication with the principal ports of Europe and Asia, as well as those of North and South America. The city lies principally on the inland side of an island and is connected with the mainland by a concrete causeway 12,642 ft. in length. Furious hurricanes sweep across the Gulf. As a protection against the violence of the sea, the grade of the city was raised on an average of 7 ft. over an area of  $2\frac{1}{2}$  sq. m. in 1905-11, an engineering feat which involved the pumping of some 20,000,000 cu. yds. of sand from the bed of the Gulf of Mexico into the city. The harbor is one of the finest on the Gulf of Mexico. It is the chief port for cotton exports and wheat shipments. Manufacturing industries include cotton compresses, railroad shops, flour and rice mills, printing and publishing plants, and manufactures of twine and cordage, barrels, clothing, and lumber products. The territory adjacent to the city is very fertile. Staples are sweet and white potatoes, corn, cabbage, cauliflower, celery, hay, peas, beans, and fruits. Figs grow abundantly, as well as pears, peaches, and plums. Fish and oysters are important; p. 80,542.

Galveston was the first city in the United States to adopt the commission form of government, which it instituted following the great storm of 1900, that left the city face to face with practical bankruptcy. For a unicameral system was substituted a mayor-president and four commissioners, the latter having full charge of the four city departments—finance and revenue, police and fire, streets and public property, water-works and sewerage. These officials are elected at large, for two years. In 1817-21 Galveston Island was the seat of Jean Lafitte and his colony of smugglers and pirates. In 1836 the site of the city was purchased from the Republic of Texas by the newly organized Galveston City Company, and in 1837 the first permanent settlement was made. The port was blockaded during the Civil War, the battle of Galveston was won by the Confederates Jan. 1, 1863, and the city was occupied by Federal troops in 1865.

**Galvez, Bernardo, Count de (1755-86)**, Spanish administrator in America, was born in Malaga and entered the Spanish army at the age of sixteen. In 1776 he became governor of Louisiana. After Spain's declaration of war against England, he became aggressive, and captured several important posts

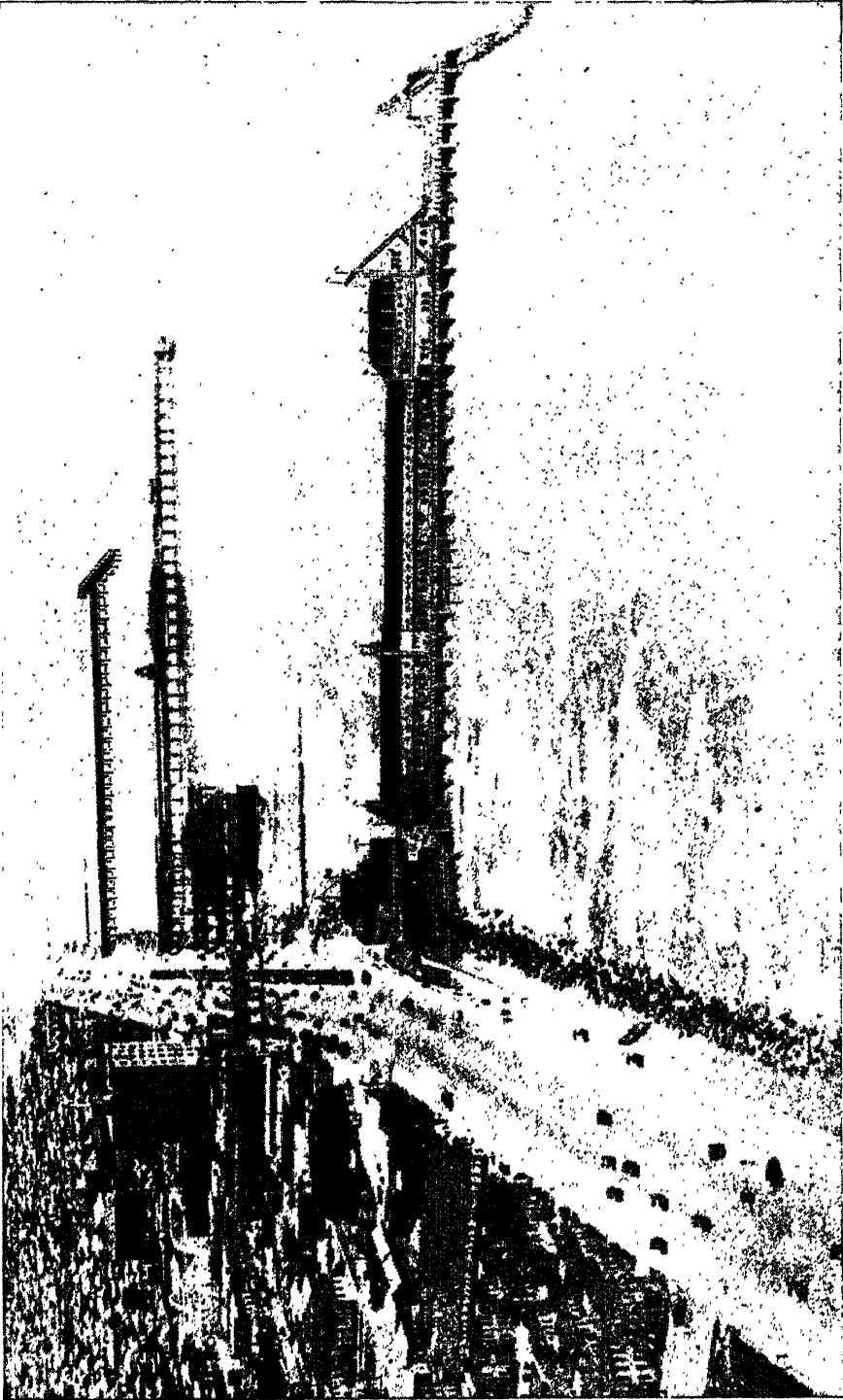
near the Gulf of Mexico. In 1781 he was assigned to the command of the forces in the West Indies; and after two years' administration in Cuba, he succeeded his father as viceroy of Mexico. He was suspected of planning to make himself king of that country, but this seems to have been due chiefly to his erection of a fortified palace at Chapultepec on the foundation of Montezuma's. His exploits were celebrated in the poems of de Poydras.

**Galway**, maritime county, Connaught, Ireland. The coast is broken by deep inlets, bordered with rugged cliffs, and fringed with islands (Inishshark, Inishbofin, Gorunna). In the w. are the wild moorland districts of Joyce's country, Connemara, and Jar Connaught; the surface is mountainous, with Bunnebeola, or Twelve Pins, reaching 2,395 ft., and the Maamturk Mts., 2,307 ft. The eastern part is comparatively level, while in the s. are the Slieve Aughty Mountains. The principal rivers are the Shannon, in the southeast, and its tributary, the Suck. Agriculture and fishing are the chief occupations; p. 182,224.

**Galway**, town and seaport, Ireland, capital of county Galway. The greater part of the town is built on a tongue of land bounded on the e. by Lough Athalia, and on the w. by the Corrib River, the other and smaller part lying to the w., across the river. A special quarter inhabited by fishermen is known as Claddagh. Features of interest are Lynch's Mansion and the Church of St. Nicholas, founded in 1320. Nothing is known of Galway until 1124, when a fort was erected there by the Connaught men; p. 13,255.

**Galway Bay**, a spacious inlet of the Atlantic Ocean, on the w. coast of Ireland; about 30 m. long and averaging 10 to 12 m. wide. The Aran Isles form a natural breakwater across its entrance.

**Gama, Vasco da (1469-1524)**, Portuguese navigator, the pioneer of European commerce and empire in the Far East, was born in Sines, in Alemtejo. Chosen leader of an expedition to explore the e. coast of Africa, Gama doubled the Cape of Good Hope in November 1497, and reached Calicut, India, in May 1498, thus opening the ocean route to the East. Returning to Portugal in 1499, he ventured on a second voyage to India in 1502. He founded the colonies of Mozambique and Sofala, on the e. coast of Africa, bombarded Calicut, and returned to Lisbon (1503) with valuable cargo. Twenty-one years afterward (1524) he was chosen viceroy



*Galveston, Texas.*

Air View Picture, showing a portion of the Galveston Sea Wall, together with Pleasure Pier which will be opened to the public at the expiration of the war.



of Portuguese India, but died the same year at Cochín. He is immortalized in the *Os Lusíadas* of Camoëns. An account of his voyages, written by a companion, Alvaro Velho, has been translated into English as *A Journal of the Voyage of Vasco da Gama* (Hakluyt Soc., 1898). Consult, also, Lord Stanley of Alderley's *The Three Voyages of Vasco da Gama* and Towle's *Vasco da Gama*.

**Gambetta, Léon** (1838-82), French statesman, opposed the constitution favored by Napoleon and in a brilliant speech, delivered in May 1870, advocated an organized democracy. After the fall of the Empire following the disaster at Sedan, he became Minister of the Interior in the provisional government and, escaping from Paris in a balloon, went to Tours, where by his eloquence and leadership he did much to restore his country's confidence. In 1871, when the National Assembly was to decide between continuation of the war and conditions of peace, Gambetta favored the former and on the Assembly's voting for the latter, resigned his position and went to Spain. On his return to France he entered the Assembly. Towards the latter part of 1871 he saw the fulfilment of a dream long cherished, the establishment of the journal *La République Française*, a strong influence for the spread of democratic principles. In 1879 he became president of the Chamber of Deputies and two years later was made premier. Consult Ghensi's *Gambetta; Life and Letters*; Reinach's *Léon Gambetta*; Deschanel's *Gambetta* (1920).

**Gambia**, British dependency on the west coast of Africa. The surface is flat and marshy, and the climate fairly healthful, but lack of rain for a large part of the year is a serious handicap to agriculture; p. 200,000, mostly Mohammedan Negroes.

**Gambia**, river, West Africa, rises in the Futa-Jallon plateau, flows w. across Gambia, and enters the Atlantic at Bathurst. Owing to its devious course, its total length is nearly 1,000 m.

**Gambier**, or **Gambir**, the Malayan name for an extract made from the leaves and small branches of *Uncaria gambir* and *U. acida*, rubiaceous shrubs cultivated in Singapore and Java. In common with cutch or catechu, gambier is sometimes called *terra japonica*.

**Gambier Islands**, a group of ten islands in the Pacific Ocean. All are rocky and barren. Quantities of pearl-shell are found in the surrounding waters. Rikitea is the principal

town. The islands have formed a French protectorate since 1844; p. 1,512.

**Gamble, Hamilton Rowan** (1798-1864), American public official. Having removed to Missouri (1818), he was elected secretary of state (1823), and afterward became chief justice of the State Supreme Court. At the beginning of the Civil War he was chosen by the Missouri Constitutional Convention to be the head of the provisional government.

**Gamble, Robert Jackson** (1851-1924), American legislator, was born in Genesee co., N. Y. He was elected to the State Senate in 1885, and served as representative in Congress in 1895-7 and 1899-1901. He was elected U. S. Senator (Republican) for 1901-07 and 1907-13.

**Gambling**, according to the law, an agreement between two or more persons whereby they risk money, or anything of value, upon the result of a game of chance, in which one or more may win and the other or others lose, the term 'game' including every possible scheme or contrivance for amusement which involves a test of skill of endurance, or any element of chance. Thus, a game of billiards, involving skill, played upon a wager between the players, is gambling; a game of roulette, involving only chance, also comes within the definition. Practically all civilized countries have sought by law at least to limit, if not suppress entirely, gambling activities. Roulette wheels, the keeping of gaming houses, faro, various lotteries, bookmaking, and wheels of fortune are among the many forms of gambling generally forbidden, but the law varies in different countries and in the different States of the United States. Gambling is openly permitted in Monte Carlo, in Monaco. Consult Proctor's *Chance and Luck*; Sir Hiram Maxim's *Monte Carlo*; Rowntree's *Betting and Gambling* (1905); Coleridge and Hawksford's *Law of Gambling* (1913).

**Gamboge**, or **Camboge**, a gum resin (80 per cent. pure resin; 20 per cent. gum) obtained from the East Indian tree *Garcinia cambogia*. When the bark of the tree is wounded the gamboge exudes as a thick, viscid, yellow juice, hardening on exposure to the air. Gamboge is chiefly employed as a water color pigment to produce bright yellow, or, mixed with blue, to make a dull green.

**Gambrinus**, a mythical king of Flanders, who is credited with the invention of beer.

**Game Laws** regulate the hunting, killing,

and taking of wild birds and animals, and may also include measures for the protection of fish and fishing rights.

In Great Britain hunting was long considered a royal sport, and laws were early enacted that reserved the privileges of the chase and of fishing to the sovereign and persons of rank and fortune. In the *United States* the ownership of migratory birds is considered to be vested in the Federal Government, while the title to other game and fish is considered to be vested in the several States. Even the owner of land has no property rights in the game which roams over it or the fish in its waters; though he may claim the exclusive right of hunting on and fishing from his land, and any one who comes upon it for such purposes, without permission, may be held liable as a trespasser. The earliest game law in the United States of which there is authentic evidence was enacted by the General Assembly of New Jersey in 1679, prohibiting the exportation of dressed deer skins from deer killed by the Indians.

The chief provisions of the State Game Laws are those establishing open and closed seasons; prescribing the manner of taking or killing game; limiting the amount to be so taken or killed; prohibiting the sale or exportation of game; and requiring a license and the payment of a license fee. State Game Commissions are usually established to enforce these laws, and to carry on the work of propagation. Most States require both residents and non-residents to procure licenses for hunting either all or certain kinds of game. In general, the times in which the young are produced are made closed or protected seasons; the times when increase will not be interfered with, and the game is best for human consumption, are selected as open seasons.

Federal Game Laws were enacted for the Indian country in 1832, for the District of Columbia in 1878 and 1899, for Yellowstone National Park in 1894, and for Mount Rainier National Park in 1899. The first comprehensive Federal legislation, however, was the Lacey Act, passed in 1900, which gives the Department of Agriculture enlarged powers as to the introduction and preservation of wild animals and birds in the United States, and recognizes and supplements the State laws on the subject. In 1913 Congress passed the *Federal Migratory Bird Law*, giving the Federal Government control of all migratory game and insectivorous birds which do not remain permanently within the boundaries of

one State, and authorizing the Department of Agriculture to prescribe and fix closed seasons for such birds.

In 1916 the United States and Great Britain negotiated an agreement for the protection of insectivorous and game birds migrating between the United States and Canada. The chief provisions are that no bird important to agriculture because of insect-destroying proclivities shall be shot at any time; that no open season on any species of game birds shall extend for a longer period than three and one-half months; and that both countries shall restrict open seasons on game birds so as to prevent their being taken during the breeding season.

Game Preserves are parks or tracts set aside for the protection of game. In the United States, national game preserves include the National Parks and more than 100 national bird refuges. Consult publications of the U. S. Biological Survey; H. Chase's *Game Protection and Propagation in America* (1913); Grinnell and Sheldon's *Hunting and Conservation* (1925).

**Gammarus**, a genus of amphipod Crustaceæ, to which belongs *G. pulex*, a common freshwater form.

**Gamtoos**, or **Camtoos**, river, Cape of Good Hope, South Africa, rises on the plateau of Great Karoo, flows s.e., and enters the sea at St. Francis Bay.

**Gamut**, popularly, the musical scale of tones and semitones that makes the octave; by association, the lines and spaces on which the notes are printed.

**Gananoque**, town, Ontario, Canada, on the St. Lawrence River. The Thousand Islands extend from this point up the river.

**Gandak**, or **Gunduck**, known also as the NARAYANI or SALGRAMI, river of India, has its source in the Nepal Himalayas, flows s.e., and joins the Ganges near Patna.

**Gandhi**, **Mohandas Karamchand** (1869- ), known commonly as MAHATMA GANDHI, East Indian political leader, was born in Porbandar. He studied law in London, was called to the bar at the Inner Temple, and on his return to India was admitted as an advocate of the Bombay High Court. In 1893 he went to South Africa and there initiated a policy of passive resistance as a protest against the indignities suffered by the Indian population. He organized the Indian Volunteer Ambulance Corps in London early in the war, and returning to India in 1915, did valuable service in war recruiting. In 1919 the passage of the Rowlatt Bill (see INDIA), designed still

further to curb the liberty of the Indians, caused Gandhi to institute a policy of non-co-operation and passive resistance to the British government which led to serious disorders in the Punjab and finally to his arrest and trial. On March 18, 1922, he was sentenced to six years imprisonment but in February 1924 he was released. The unlettered people whom he championed revered him for his asceticism and eloquence, investing him with the title of Mahatma (Great Soul). In 1930, in protest against the Salt excise laws, he inaugurated further campaigns of civil disobedience, was once more imprisoned and later released. In 1934 he resigned leadership of the All India Congress party. July 11, 1942, the party's working committee rejected the British plan for post-war freedom and accepted Gandhi's plan for a civil disobedience movement. Gandhi, with the leaders of the party, was imprisoned. Feb., 1943, he protested the imprisonment by a 21-day fast. Politically, however, the fast was a failure. On May 5, 1944 he was released 'for medical reasons.' He gave a plan for dividing India into Hindu and Mohammedan states.

**Gandolfo.** See **Castel Gandolfo**.

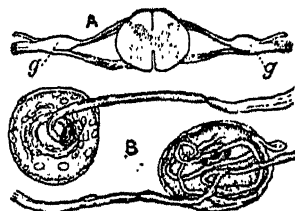
**Ganelon**, in romance, one of Charlemagne's paladins, but a traitor, who, through jealousy of Roland, plotted with the Moorish king the attack on Roncesvalles, in which Roland was slain.

**Ganesha**, or **Ganapati** (i.e., 'Lord of hosts'), the Hindu god, son of Siva, who rules over the demon hosts, especially controlling malignant spirits. He is represented as a very stout man, with the head of an elephant and four arms.

**Ganges**, the great river of Northern India, prominent in both the religion and geography of the East. Its basin, which lies between the Himalayas and the Vindhya mountains, and extends eastward to the mountain barrier between Burma and Bengal, is a rich alluvial plain, remarkable for its fertility and density of population. It covers 390,000 sq. m., and its length is 1,557 m. Rising in a Himalayan ice cave known as Bhagirathi, in about 31° N. and 79° E., in the state of Garhwal, the Ganges descends as a roaring torrent to Gangotri (alt. 10,319 ft.), where there is a temple famed as a pilgrim resort. It receives the Alaknanda about 130 m. from its source, and enters British India a little above Hardwar. Thence, with many a shoal and rapid in its winding stream, it flows s.e. past Farukhabad to Cawnpur. At Allahabad it receives the Jumna, and drains, by means of its main

stream and its tributaries (Chambal and Betwa), Rajputana, Sindh, and Bundelkhand. Soon after leaving Allahabad the river turns eastward, and passes Mirzapur, Benares, Ghazipur, Patna, Monghyr, and Bhagalpur, receiving on its left bank the Gumti, the Gogra, and the Gandak, and on its right bank the Son. Some one hundred and forty m. from the sea it unites with the Brahmaputra to form the largest delta in the world. Between the rivers Ganges and Jumna (the Doab) is a system of irrigating canals, known as the Ganges Canals. 'Mother Ganges' is held in peculiar veneration by the Hindus, and every foot of its course from its source to the sea is holy—the confluences of the river with its tributaries, as at Allahabad, being especially so. To bathe in its waters means purification from sin; to die by its stream is blessedness; to be cast into the river after death ensures eternal peace.

**Ganglion, or Knot.** (1.) A collection of nerve cells on the course of a nerve, forming an obvious swelling. (2.) In surgery, the swelling caused by the collection of fluid in the fibrous sheath which surrounds a tendon. It arises from inflammation of the tendon-sheath, and occurs most often at the back of the wrist, over one of the extensor tendons of the hand.



*Nerve Ganglia.*

A, Section of spinal cord and spinal nerves—g, g, ganglia; B, nerve cells from spinal ganglia.

**Gangrene**, or **Mortification**, is a local death which results in a portion of the body, generally a limb or part of a limb, undergoing putrefaction or mummification, with subsequent separation from the healthy tissues. Gangrene results from the action of bacilli upon tissues whose vitality has previously been lowered. In dry gangrene the dead part shrivels up and assumes a mummified appearance; in moist gangrene, which is more associated with venous obstruction than the other, the parts are soft, putrescent, and malodorous, while in some cases the development

of putrefactive gases leads to the formation of bullæ beneath the dead skin. Hospital gangrene was the scourge of surgeons before the era of Lister and the advent of antiseptics.

**Gangue** is the non-metalliferous vein-stuff in which metallic ores occur.

**Gangway.** In the early days of sailing line-of-battle ships and frigates, the gangway was a broad passageway along the ship's side, connecting opposite ends of the partial upper decks—(quarterdeck, half-deck, etc.) which only extended part way from stem and stern. The term is now commonly applied to the passageways on each side of the upper deck immediately forward of the quarter-deck and to the aperture in the side of the ship which affords access to the accommodation ladder. Less specifically the term is applied to any passageway or thoroughfare.

**Ganjah**, the name given to the dried plants of Indian hemp before the resin has been removed.

**Gannet**, or **Solan Goose** (*Sula baccana*) a large marine bird which nests in scattered localities in most parts of the world where remote rocky cliffs or islets favor its security.

**Gannett, Ezra Stiles** (1801-71), American clergyman, was made colleague of William Ellery Channing in the Federal Street Church (Unitarian) at Boston, succeeding him as pastor in 1842. He took a leading part in the early Unitarian movement in New England, and was president of the American Unitarian Association from 1847 to 1851. He was editor of several religious papers, including the *Christian Examiner*. See *Ezra Stiles Gannett: A Memoir*, by his son (1875).

**Gannett, Henry** (1846-1914), American geographer. Among his famous works were: *Boundaries of the United States and of the Several States and Territories*, *Dictionary of Altitudes in the United States*, and a *Statistical Atlas of the United States* (1898 and 1903).

**Gannister**, or **Ganister**, a fine, compact, hard sandstone which occurs in some parts of the Carboniferous rocks of the north of England. It is used for grindstones.

**Ganoids**, or **Ganoidei**, an order of fishes which includes seven living genera, whose members are all found in fresh water—Acipenser (the sturgeon), Amia (the bow fin), Lepidosteus (the gar-pike), Polyodon (the spoon-bill), Polypterus, Calamoichthys (the reed-fish), Scaphirhynchus (the shovel-beak). See Zittel-Eastman, *Text-book of Paleontology* (1902).

**Gansevoort, Peter** (1749-1812), Amer-

ican soldier, was born at Albany, N. Y. Having been promoted to be lieutenant-colonel in 1776, he was placed in command of Fort George, and the next year, as colonel, in command of Fort Stanwix (or Schuyler). He successfully defended it for twenty days against the British commander, St. Leger, and his Indians and Tories, and thereby prevented his junction with Burgoyne. He was finally relieved by Benedict Arnold's reinforcements. In 1779, at the head of a body of picked men under Sullivan, he captured a large body of Indians in the lower Mohawk castle. In later years he was commissioner of Indian affairs, commissioner on frontier fortifications, and military agent.

**Ganymede**, son of Tros, king of Troy. He was held to be the most beautiful of men, and was carried off by the gods to be the cup-bearer of Zeus, and to dwell in Olympus. See Gayley's *Classic Myths in English Literature* (1893).

**Gapon, Father** (1839-1906), Russian priest and agitator, born at Poltava. Father Gapon came prominently before the public as the leader in the strikes in St. Petersburg during the winter of 1905. Immediately thereafter Father Gapon fled, and lived for some time in London, where he published *The Story of My Life* (1905). He reappeared in St. Petersburg in Dec., 1905, and soon thereafter the revolutionary papers charged him with being in the pay of Premier Witte and of working against the revolution. In April, 1906, a body found in a country house near St. Petersburg was identified by Gapon's lawyer as that of the priest. At the same time a communication appeared in the revolutionary newspapers, stating that Gapon had accepted money from subordinates of Witte to betray the revolution. Whereupon, the communication continued, he had been sentenced to death. In his *Life* Gapon says that he had received money from the police authorities to help him carry out his labor movements before the massacre (of Jan., 1905), and that he had done so to throw the police off the scent.

**Gar**, a name given to several orders of fishes having long, sharp snouts.

**Garb**, in heraldry, a sheaf of wheat. If of any other grain, the kind must be specified.

**Garbo, Greta** (1906- ), moving picture actress, was born in Stockholm, Sweden. She won recognition first in 'Goesta Berleig,' and through work in the Royal Academy. She came to the United States and appeared in *The Temptress, Flesh and the Devil, Anna*

*Christie, Susan Lenox, Mata Hari, As You Desire Me, Grand Hotel, and Ninotchka*. She won the Academy of Arts and Sciences award for fine acting in 1935. Her appearance in *Camille*, according to the critics, placed her at the top of her profession.

**Garcia, Manuel del Popolo Vicente** (1775-1832), Spanish tenor singer and musical composer. In Italy, his opera, *Il Califo di Bagdad*, was favorably received, and his singing much admired. He visited the U. S., Mexico, and South America, and was everywhere enthusiastically received.

**Garcia, Manuel** (1805-1906), born at Madrid, won a brilliant reputation as a teacher of singing. He wrote *Mémoire sur la Voix Humaine* (1840) and *Traité de l'Art du Chant* (1841). He was also famous as the inventor of the laryngoscope.

**Garcia III., 'The Trembler'** (958-1001), king of Navarre, began to reign in 994. He helped to defeat Almansor, general of the caliph of Cordova, at Calatañazor (998). He was the father of Sancho the Great.

**Garcia Gutierrez, Antonio** (1813-84), Spanish dramatist, born at Chiclana, prov. Cadiz. In 1836 he published his first tragedy, *El Trovador*, which was enthusiastically received; this was the literary progenitor of Verdi's better-known opera, *Il Trovatore*. Among his later dramatic productions are *Juan Lorenzo* (1865), esteemed a masterpiece of modern Spanish drama; and *Venganza Catalana* (1864). Gutierrez also published a collection of lyrical poetry, *Luz y Tinieblas*.

**Garcia y Iniguez, Calixto** (1836-98), Cuban soldier and patriot. After the outbreak of the last rebellion he escaped (1895) to Paris, thence to the United States, and reached Cuba on the *Bermuda*, with field guns and other military supplies. He won several victories over the Spaniards, and in the Spanish-American War led a Cuban force of 4,000 at El Caney (1898).

**Garcilaso de la Vega** (c. 1540-1616). Spanish-Peruvian historian, self-surnamed 'the Inca,' whose works furnish the chief sources of information concerning the ancient Peruvians. He was born at Cuzco, Peru, about 1540, the son of one of the Spanish conquerors of the country who married a princess of the Incas and a niece of Huayna Capac, the last emperor of Peru. His first original work was a history of Florida, containing an account of the conquest of the country by De Soto. In 1609 appeared the first part of his *Royal Commentaries of Peru*.

**Garcinia**, a genus of tropical evergreen

trees belonging to the order Guttiferæ. They all bear edible fruit, that of the mangosteen (*G. mangostana*) being especially delicate in flavor. Another species is the gamboge (*G. gambogia* or *G. morella*), so called from its cherry-like fruit.

**Gard**, dep. of S. France, between the Rhone or the e. and the Cévennes Mts. on the w. The department drains from the Cévennes towards the Rhone by the Ardèche, Cèze, and Gardon, and towards the Mediterranean by the Vidourle and the Hérault. All the rivers are subject to sudden and disastrous floods. The chestnut, mulberry, and olive trees and the vine cover large areas; and the department is very rich in minerals.

**Garda, Lago di**, Italy, on the n. edge of the plain of Lombardy, between Venice and Milan. It is the *Lacus Benacus* of Virgil (*Georg.*, II. 160). The clear waters of the lake abound in fish of various kinds; its surface is studded with many islands. The mild climate and the beauty of its vicinity have caused its shores to be lined with beautiful villas. The inspiration of its beauties is perpetuated in the poetry of Virgil, Catullus, Dante, Tennyson, Carducci, and others.

**Garden, Mary** (1877), American soprano, was born in Aberdeen, Scotland, and was brought when a child to the United States. She studied vocal music under Trabadello, Chevallier, and Fugère at Paris; in 1900 made her *début* in Charpentier's *Louise* at the Opéra Comique, scoring a distinct success; and in 1902 created the part of Melisande in Debussy's *Pelléas and Melisande*. Since her first American appearance in *Thaïs* at the Manhattan Opera House, New York, in 1907, she has been a warm favorite of the American musical public. In 1921 she was appointed director general of the Chicago Opera Association and in 1922 became one of the principals of the Chicago Civic Opera Company.

**Garden City**, village, Nassau co., Long Island, New York, is the seat of the Protestant Episcopal Cathedral of the Incarnation, a fine Gothic edifice containing an organ valued at \$100,000, and of the cathedral schools of St. Paul's and St. Mary's. The publishing works of Doubleday, Doran & Co. are located here. There are boat and airplane factories. The place was founded by the merchant Alexander T. Stewart, who laid it out as a model village; p. 11,223.

**Gardenia**, a genus of tropical trees and shrubs belonging to the order Rubiacæ. They have evergreen foliage, and bear beautiful white, fragrant, campanuliform flowers. The

*Cape Jasmine* from China, often grown out of doors in the Southern United States, is *Gardenia jasminoides* or *G. florida*. It has fragrant white, waxy, double flowers, resembling the camellia.

**Gardening, or Horticulture.** A branch of agriculture in the widest sense of that term, gardening is closely related to the practice of agriculture on the one hand and to the science of botany on the other. For purposes of discussion, however, it may be distinguished from both, the term *agriculture* being limited to farming, or the cultivation of cereal, forage, root, and textile crops and the raising of live stock; the term *botany* to the biology of plants apart from their economic application; and the term *gardening* to the art of growing flowering plants, fruits, or vegetables for use, ornament, or pleasure. It usually implies close cultivation over a somewhat restricted area. It includes Ornamental Gardening, which in turn includes Landscape Gardening, Amateur Flower Gardening, and Floriculture; Vegetable Raising, whether on a commercial scale or solely for home consumption; and Fruit Raising.

The essentials of all gardening are soil of a suitable texture, containing available plant food; water to dissolve the plant food, so that the plant rootlets may make use of it; seeds or plants which will produce the desired crops; sunshine and warmth to bring about germination and plant development; and cultivation to conserve the moisture, kill weeds, and incorporate air into the soil. Location and exposure cannot always be considered, especially in gardening small plots, but it should be borne in mind that frost is less likely to injure plants planted on high ground than those planted in low places or valleys into which the heavier cold air commonly settles; that crops will mature more rapidly on land that has a sunny, southern exposure than on other plots; that the garden should be fairly level, but well drained; and that a warm, sandy loam will produce an earlier crop than a heavier soil that retains more water and less heat. A high proportion of humus or rotted vegetable material is desirable in the soil, since it produces an open texture, adds nitrogen, insures the presence of beneficial bacteria, aids in unlocking plant food from mineral particles, and increases the moisture-retaining properties of the soil.

Ornamental Gardening has been practised in Oriental countries from time immemorial; the ancient monuments of Egypt show plans

of irrigated gardens as early as 1,600 years B.C.; while the Hanging Gardens of Babylon were counted among the wonders of the world. The Greeks copied their gardening practices from the Persians, when public gardening became a feature of later Greek development; and such gardening as was practised by the Romans closely followed Greek models.

During the Dark Ages practically the only gardening was that carried on by the monks in the growing of medicinal herbs. Later, gardens were formed around the principal castles. Various herbs, shrubs, vegetables, and flowers were grown, and in the more pretentious gardens, arbors, fountains, trimmed hedges, grassy seats, and shade trees were pleasing features. The topiary art, or the pruning of trees or shrubs into fanciful figures, as birds or animals, was known to the Romans, and became a prominent feature of English gardening early in the 15th century.

Following the Renaissance came the formal geometrical and architectural style of gardening patronized by the family of the Medici of Italy, and long a model for all Europe. The French style of gardening came into prominence during the reign of Louis XIV., through the celebrated Le Nôtre, who laid out the garden at Versailles. The first greenhouse was also erected at this time by M. Fagon in the *Jardin des Plantes*. Thenceforth hothouses and orangeries became features of the gardens of the nobility of Northern Europe.

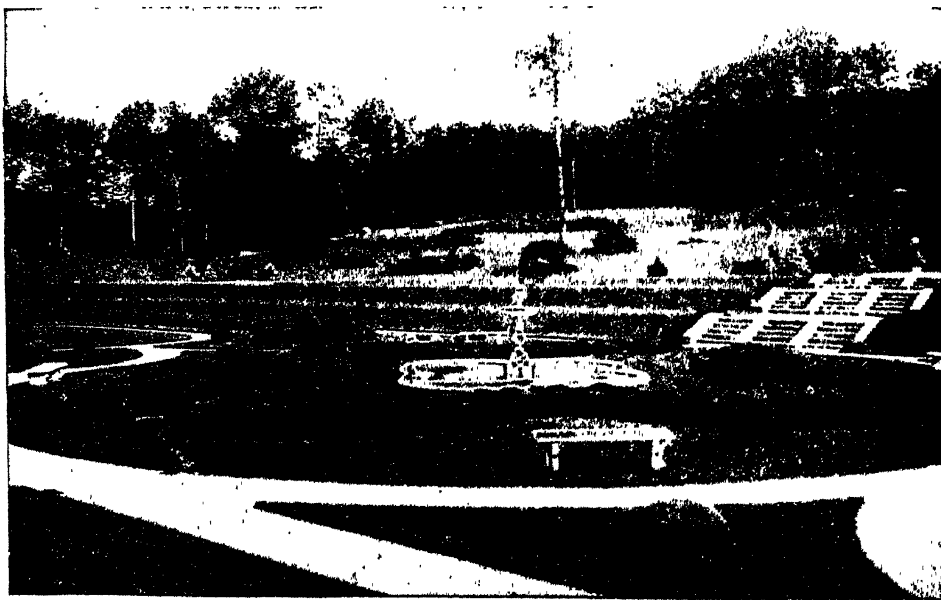
In the formal gardens of England, during earlier times, bowling greens, clipped yews, and sun dials were characteristic features, until the 18th century, when a reaction set in, and the natural method of gardening came into existence; artificial lakes, streams, and basins were created; and curved driveways, open vistas, and banked masses were employed. This, in its simplified form, is the style of gardening now commonly employed in the United States in public parks and grounds, cemeteries, large estates, and home grounds.

While this form of gardening is properly Landscape Gardening, the principles involved are of such fundamental importance that they may be briefly stated, as follows: Keep the center open; frame and mass the sides; avoid scattered effects. Flowers and high-colored foliage are most effective against a background of green foliage. A flower bed in the middle of a lawn is only a flower bed; against

the border it is not only a flower bed, but it may also be a structural part of a picture. Flowers are incidents in a landscape picture. They add emphasis, supply color, give variety and finish; they are the ornaments, but the lawn and the mass plantings make the framework. One flower in the border, serving as a true incident of the picture, is more effective than twenty flowers in the center of the lawn. More depends upon the position which plants occupy with reference to each other and to the structural design of the garden than upon the intrinsic merits of the plants themselves.

over. Detailed suggestions for planting the commoner annuals and perennials raised from seed are given in the accompanying table.

Rock gardens form a most interesting feature of many large gardens. They are grown frequently on masses of stone artificially placed to simulate natural conditions. The crevices, pockets, and overhanging ledges are filled with earth and planted with Alpine plants and species of small stature from lower altitudes. The alyssums or madworts, anemones, columbine, campanulas, cyclamen, dog's-tooth violet, gentian, forget-me-not,



Copyright by Brown Bros.

*American Garden. R. Delafield, Tuxedo Park, N. Y.*

The time of planting varies. Most annuals will bloom in the latitude of Central New York if the seeds are sown in the open ground when the weather becomes thoroughly settled. Perennials may be raised from seed, planted in the spring, the plants being separated into rows in July, and transplanted in the fall; or from roots obtained by dividing the plants in the autumn, the general practice being to divide the plants every second or third year. Spring flowering bulbs, as the crocus, tulip, lily of the valley, hyacinth, narcissus, and snowdrop, should be planted in the fall. The gladiolus, tuberose canna, amaryllis, and other less hardy bulbs should not be put in the ground till after cold weather is

primulas, ferns, heaths, saxifrages, sempivernum, and aubrietia are among the plants most suited to this form of garden.

Water gardens may be made in either natural or artificial lakes, provided a constant supply of fresh water and a means of disposing of surplus water are assured. Two or two and a half feet of water is ample. Nymphaeas or water lilies are the most popular plants for the deeper water, while irises may be grown in the shallower water or mud, and marsh marigolds, forget-me-nots, water grasses, pitcher plants, hardy orchids, and ferns along the margins. Window gardens are of two types—the window boxes and porch boxes used out of doors in the summer time,

and the winter indoor garden of house plants. For the outdoor garden a stout pine box is used, preferably fitted with a zinc tray to conserve moisture and filled with a good potting earth. Geraniums, heliotropes, lobelias, tropeolums, Kenilworth ivy, verbenas, sweet alyssum, and petunias are among the plants most used.

The indoor window garden should occupy a window with a southern, southeastern, or eastern exposure, in a room maintained at a fairly uniform temperature. The box or pots

during the winter months, making an excellent addition to the window garden.

*Lawns.*—Lawns formerly were the most important part of a suburban garden. With the growth of city gardens (see below) they became not so all important, but they still make an attractive adjunct. They can be made from turf or seed. In either case there must be adequate drainage. The soil for planting seed should be prepared in September. Turf may be laid between November and March. The turf should be levelled and made firm; young



*A Modern Garden: Informal Type.*

should be so arranged that their position can be changed from time to time in order that the plants may receive light from all sides. Among the familiar flowering house plants are begonias, calla, heliotrope, Chinese hibiscus, jasmynes, petunias, freesias, geraniums, sweet alyssum, oxalis, lobelia, and mesembryanthemum. Foliage plants include palms, cannas, ferns, tradescantia or wandering-jew, English and Kenilworth ivy. Climbing plants are *Asparagus tenuissimus* and *plumosus*, smilax, Madeira vine, Japanese hop, and the parlor ivies. Bulbs of hyacinths, narcissus, tulips, crocus, and other spring-blooming plants, potted in the fall and kept in a cool, shady place from 6 to 8 weeks, may be brought to bloom

grass should be rolled when it comes up from seed. Weeds must be continually removed. Annual fertile soil and manure should be applied as a dressing. Watering is important; a good watering reaching to the roots weekly is better than a light sprinkle more often; but although the watering should be gentle enough not to force uneven ruts into the soil, water sprinkled on the top lightly, without soaking down to the roots, is not retained in dry spells and merely forms a crust on the soil which prevents natural moisture of the air reaching the thirsty roots.

*Floriculture*, or the cultivation of flowers and decorative plants on a commercial basis,



## Planting Table for Common Garden Flowers

Flower	Time to Plant in Hotbed	Time to Plant in Open Ground	Inches Between Rows	Inches Between Plants	Depth to Plant Seed (inches)	Season of Blooming
Ageratum.....	March...	May.....	12.....	6.....	$\frac{1}{4}$ to $\frac{1}{2}$	June to frost
Alyssum.....		May.....	12.....	6.....	$\frac{1}{4}$ to $\frac{1}{2}$	June to frost
Aster.....	March...	May.....	12.....	9 to 12..	$\frac{1}{2}$ to $\frac{3}{4}$	July to Oct.
Balsam.....	April....	May.....	24.....	24.....	$\frac{1}{2}$ to $\frac{3}{4}$	July to frost
Calendula.....	April....	May.....	12.....	6.....	$\frac{1}{4}$ to $\frac{1}{2}$	June to Oct.
Campanula.....	March...	April or May...	12 to 18	12.....	$\frac{1}{4}$ to $\frac{1}{2}$	June to Aug.
Candytuft.....	April....	May.....	12.....	4 to 6....	$\frac{1}{4}$ to $\frac{1}{2}$	June to Oct.
Centaurea.....	April....	May.....	18.....	6.....	$\frac{1}{4}$ to $\frac{1}{2}$	June to frost
Chrysanthemum..	March...	May.....	12 to 18..	8.....	$\frac{1}{2}$	June to Oct.
Cockscomb (low)	April....	May.....	18.....	12.....	$\frac{1}{4}$ to $\frac{1}{2}$	June to frost
Cockscomb (tall)	April....	May.....	24.....	24.....	$\frac{1}{4}$ to $\frac{1}{2}$	June to frost
Coreopsis.....	March...	April.....	18.....	10.....	$\frac{1}{2}$	June to frost
Cosmos.....	April....	May.....	24 to 30..	24.....	$\frac{1}{2}$	July on
Dahlia.....	March...	May.....	12 to 18..	6.....	$\frac{1}{2}$	Aug. to frost
Dianthus.....	March...	May 1-10	12 to 18..	6.....	$\frac{1}{4}$ to $\frac{1}{2}$	July to frost
Hollyhock.....	March...	July to Sept....	24 to 36..	15.....	$\frac{1}{2}$	Aug. on
Larkspur.....	March...	May.....	12.....	12.....	$\frac{1}{4}$ to $\frac{1}{2}$	June to Sept.
Marigold.....	April....	May.....	12.....	6.....	$\frac{1}{4}$ to $\frac{1}{2}$	July to frost
Mignonette.....	March...	May.....	12.....	12.....	$\frac{1}{4}$ to $\frac{1}{2}$	July to frost
Morning glory..		April.....	To climb.		$\frac{1}{2}$ to $\frac{3}{4}$	June to frost
Nasturtium.....	April....	May.....	12.....	12.....	$\frac{1}{2}$ to $\frac{3}{4}$	June to frost
Pansy.....	March...	April.....	12.....	6.....	$\frac{1}{4}$ to $\frac{1}{2}$	April to frost
Petunia.....	Feb. or March.	May.....	12.....	12.....	$\frac{1}{4}$	June to frost
Phlox (annual) ..	March...	May.....	18.....	12.....	$\frac{1}{4}$ to $\frac{1}{2}$	June to frost
Poppy.....		Apr., Sept., Oct....	12.....	12.....	$\frac{1}{4}$	June to Aug.
Salvia.....	March...	May.....	24.....	18.....	$\frac{1}{4}$ to $\frac{1}{2}$	Aug. to frost
Snapdragon.....	March...	May.....	12.....	12.....	$\frac{1}{4}$ to $\frac{1}{2}$	July to frost
Stock.....	March...	May.....	18.....	12.....	$\frac{1}{4}$ to $\frac{1}{2}$	July to Sept.
Sunflower.....	April....	May.....	36 to 60..	24 or more		Aug. to frost
Sweet peas.....		April.....	36 to 48..	Thick....	1 to $1\frac{1}{2}$	July to Sept.
Sweetwilliam....	March...	June.....	12.....	6.....	$\frac{1}{4}$ to $\frac{1}{2}$	June, July

is treated in a separate article (see FLORICULTURE).

By the exercise of care and forethought in planning succession crops and rotations, and by the utilization of every foot of available space, it is possible to grow considerable quantities of vegetables in a limited area, as in city and suburban back yards or small plots in villages and towns. Important factors are the use of seed boxes, hotbeds, cold frames, and outside seed beds, and the planting of late or succession crops as soon as earlier plants have been removed.

Any sort of wooden box filled with good

soil and kept in the house will serve as a seed box. The soil should be pressed down firmly and the seed distributed, 8 or 10 to the inch in rows made,  $\frac{1}{4}$  to  $\frac{1}{2}$  inch deep, and about 2 inches apart. The box should be kept in a warm, sunny place, and watered from time to time. When the plants have reached a height of an inch to an inch and a half they should be thinned to one or two inches apart in the row. When the weather becomes mild the box should be set out of doors part of the time, so that the plants will 'harden off' in preparation for transplanting later.

The hotbed is a box-like glass-covered

structure which not only collects heat from the sun, but also generates heat of its own from fermentation in fresh manure. After the heat has reached its maximum and has subsided to between 80° and 90° F., the seeds may be planted. The bed should be kept partially dark until the seeds germinate, but after germination the plants need plenty of light, careful watering, and ventilation. The cold frame, used in hardening plants started in the hotbed, is constructed in much the same manner, except that good potting soil is used instead of manure, and the frame may be covered either with glass sash or canvas. In mild climates the cold frame takes the place of the hotbed for starting plants before seeds can be safely planted in the open. The seed bed is a small area of the garden in which the gardener starts the second crops while the ground in which they are to develop is still occupied. For small gardens intended for intensive cultivation the preparation of the soil is of special importance. The earth may be well loosened with the garden fork or spade to a depth of 6 to 10 inches, all lumps being broken up and the soil later pulverized with a steel-tooth rake. Any sod or plant growth should be turned under to rot and form humus. Where the soil is heavy and contains a large proportion of clay, clean sand or well sifted coal ashes may be added for lightening, while a thin coat of air-slaked lime spread on the ground and well worked in will tend both to lighten the soil and to correct acidity.

After the soil has been thus prepared it is usually advisable to apply some form of fertilizer. Barnyard or stable manure is undoubtedly the best, being applied on the basis of 20 to 30 tons to the acre, or 400 to 600 pounds for a plot 20 x 20 feet, and later worked in with a hoe and rake. Commercial fertilizers may also be used. Small plants which are to be left almost touching each other, as onions and carrots, are said to be grown in *drills*; plants grown at fixed distances, as cabbages, in *rows*; and plants grown at distances of several feet apart in both directions, as corn, in *hills*. For planting in drills or rows, furrows or shallow trenches are opened with the hoe, rake handle, or similar tool, but hills may be opened with a spade or trowel. Fertilizer applied in the drills, rows, or hills before planting and mixed well with the soil gives good results. The seeds are then sown, forced gently into the earth, and covered immediately. Thick sowings are often made to insure a good

stand, and the superfluous plants later pulled up.

If young plants are to be set out they should be watered thoroughly several hours before transplanting, lifted out of the hotbed or cold frame with a trowel, keeping as much soil as possible on the roots, and inserted into a hole opened with a trowel or dibble. The soil is then drawn up to the stalk and firmed with the knuckle or ball of the thumb. In dry soil about a pint of water should be poured into each hole before the plant is set. Transplanting should be done in cloudy weather or late in the afternoon, if possible, and the young plants should be shaded with newspapers for a few days if the sun is bright. Detailed suggestions for planting are given in the accompanying table, from *Farmer's Bulletin No. 818*, issued by the U. S. Department of Agriculture.

After the seeds have sprouted or the young plants have been set in their permanent locations, repeated stirring of the soil with hand tools or a wheel cultivator should be practised between the rows and about the plants. The soil should be kept clear of weeds, and spraying and other protective measures should be practised to combat insect pests. During prolonged dry spells, water should be supplied artificially by sprinkling or some other method of irrigation. This should be done very early in the morning or after sundown.

Since a number of vegetables mature early in the season, it is possible to utilize the space occupied by these for successive plantings of the same vegetable or for rotation plantings of different plants. Thus successive crops may be grown of radishes, spinach, lettuce, peas, parsley, dwarf beans, turnips, and kohlrabi, or these may follow or be followed by other crops. Crops which may be succeeded by later ones are onion sets and early varieties of beets, turnips, carrots, corn, and cabbage; others which may follow earlier ones are late beets, late peas, celery, Brussels sprouts, late cabbage, cauliflower, kale, endive, and flat turnips. Asparagus, rhubarb, pole beans, late carrots, parsnips, salsify, late corn, cucumbers, melons, squash, pumpkins, tomatoes, eggplant, peppers, onions grown from seed, leeks, okra, potatoes, and rutabagas, occupy the ground all season.

*Market and Truck Gardening.*—Near all the large cities and towns, vegetables are extensively grown and marketed by the producers—a method of farming known as market gardening. Farther from markets are those wide areas in specially favored regions where

truck farming or the raising of vegetables for long-distance shipment and distribution to the smaller markets is carried on. The chief truck-gardening regions of the United States have become such because they are specially adapted on account of soil, climate, and easy access by rail or by boat to the principal cities, for raising and shipping fruits and vegetables.

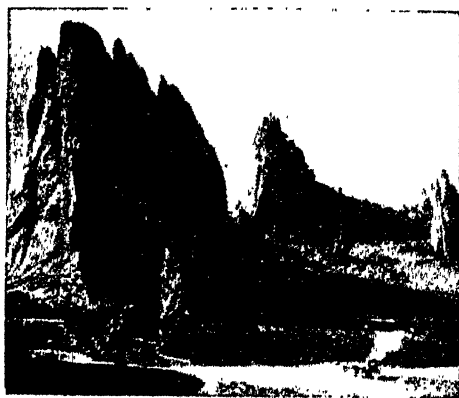
**Gardening Under Glass.**—The growing of vegetables and flowers under glass in winter is an important industry in many Northern States in the vicinity of the larger cities and towns. The chief vegetables grown are lettuce, tomatoes, radishes and cucumbers, though minor crops, like beans and melons, are also raised. Fruits are not grown under glass to any considerable extent in the United States, but flowers are extensively grown.

**School Gardens** are flower and vegetable gardens used for educational purposes in connection with the schools. The garden may be divided into plots, each of which is assigned for a season to an individual pupil, who plants it, cares for it, and has absolute control of the produce; it may be conducted under the community system, all the pupils co-operating in its care and the produce being used for a common purpose; or the two methods may be combined, individual vegetable gardening being supplemented by group responsibility for flower beds, for plots devoted to exotic plants grown for observational purposes, and for the care of paths.

**War Gardens.**—The readiness with which gardening lends itself to public service was well attested in the War-Garden Movement in the U. S., 1917-18. The motto, 'Food will win the war,' provided the text; thousands of vacant lots and little-used pieces of land supplied the means; and patriotism the incentive. The production of great quantities of food materials was the immediate result, with consequent saving of coal and cargo space in transportation. In World War II the Victory Garden came to the fore and flourished in country and city. Again the campaign popularized gardening.

**Small City Gardens.**—Of late years, especially in New York, a practice common in Spain has reached the United States. Where lack of usual gardening conditions prevents usual methods, soil may be imported (as to city back yards) in shallow boxes, pots, etc., and combined with aquariums, awnings, iron-work brackets, and ornamental walls with statuary and wall foundations, to give the effect of a big garden in small space. Water in tubs or basins or fountains play an im-

portant part in giving an effect of nature; but the plants chosen should be those requiring little water and thriving in hot, dry air such as is common to cities. Cactuses in great variety have proved valuable for these gardens. The popularity of Flower Shows in recent years has attested to the growing interest in the small garden; in New York and other large cities each year samples of these gardens are shown and advice and suggestions given to the amateurs as well as professionals in gardening matters. In connection with the subject of Gardening see the article on AGRICULTURE and the cross references there cited; also PLANTS; BULBS; CUTTINGS; ELECTROCULTURE OF PLANTS; FLORICULTURE; FORCING; GRAFTING; GREENHOUSE; HOTHOUSE; LAWNS; PRUNING; SHRUBS; TRANSPLANTING; TREE SURGERY; and the separate articles on the various plants, vegetables, and fruits.



*Scene in The Garden of the Gods,  
Colorado.*

**Garden of the Gods**, a tract of 480 acres noted for its great scenic beauty, 5 m. n. of Colorado Springs, Col. It has many cliffs and crags of red and white sandstone, of weird and grotesque shapes. The Garden affords a fine view of Pike's Peak. It was presented to Colorado Springs by its owners, the children and heirs of Charles E. Perkins, and the gift was accepted by the city on Dec. 24, 1909.

**Garden Warbler** (*Sylvia hortensis*), a European warbler of the same genus as the blackcap and the whitethroat.

**Gardiner**, city, Kennebec co., Maine. The manufactures include lumber, paper, and pulp mills, shoe factories, foundries and machine shops, and electric railway supplies. The ice industry is important in winter. Gardiner was

## GARDENER'S PLANTING TABLE

Kind of vegetable	Rows apart for horse cultivation	Rows apart for hand cultivation	Plants apart in rows	Depth of planting	Time of planting in open ground in South	Time of planting in open ground in North
Artichoke, globe	3 to 4 ft.	2 to 3 ft.	2 to 3 ft.	1 to 2 in.	Spr. . . . .	Spr.
Artichoke, Jerusalem	3 to 4 ft.	1 to 2 ft.	1 to 2 ft.	2 to 3 in.	Spr. . . . .	Spr.
Asparagus, seed	30 to 36 in.	1 to 2 ft.	3 to 5 in.	1 to 2 in.	Aut. or early Spr.	Early Spr.
Asparagus, plants	1 to 5 ft.	12 to 24 in.	15 to 20 in.	3 to 5 in.	Aut. or early Spr.	Early Spr.
Beans, bush	30 to 36 in.	18 to 24 in.	5 or 8 to ft.	½ to 2 in.	Feb. to Apr. [Aug. to Sep.]	Apr. to July May and June
Beans, pole	3 to 4 ft.	3 to 4 ft.	3 to 4 ft.	1 to 2 in.	Late Spr. . . . .	May and June
Beets	24 to 36 in.	12 to 18 in.	5 or 6 to ft.	1 to 2 in.	Feb. to Apr. [Aug. to Sep.]	Apr. to Aug. May and June
Brussels sprouts	30 to 36 in.	24 to 30 in.	16 to 24 in.	½ in.	Jan. to July	Mar. and Apr. (hotbed Feb.)
Cabbage, early	30 to 36 in.	24 to 30 in.	12 to 18 in.	½ in.	Oct. to Dec.	
Cabbage, late	30 to 40 in.	24 to 36 in.	16 to 24 in.	½ in.	June and July	May and June
Cardoon	3 ft.	2 ft.	12 to 18 in.	1 to 2 in.	Early Spr.	Apr. and May
Carrot	30 to 36 in.	18 to 24 in.	6 or 7 to ft.	½ in.	Mar. and Apr. [Sep.]	Apr. to June
Cauliflower	30 to 36 in.	24 to 30 in.	14 to 18 in.	½ in.	Jan. and Feb. [June]	Apr. to June. (Start in hotbed during Feb. or Mar.)
Celery	3 to 6 ft.	18 to 36 in.	4 to 8 in.	1-8 in.	Aug. to Oct.	May and June. (Start in hotbed or cold frame in Mar. or Apr.)
Chervil	30 to 36 in.	18 to 24 in.	3 or 4 to ft.	1 in.	Aut.	Aut.
Corn, sweet	30 to 42 in.	30 to 36 in.	30 to 36 in.	1 to 2 in.	Feb. to Apr.	May to July
Cress, water	Broadcast			On surface	Early Spr.	Apr. to Sep.
Cucumber	4 to 6 ft.	4 to 6 ft.	4 to 6 ft.	1 to 2 in.	Feb. and Mar. [Sep.]	Apr. to July
Eggplant	30 to 36 in.	24 to 30 in.	18 to 24 in.	½ to 1 in.	Feb. to Apr.	Apr. and May. (Start in hotbed during Mar.)
Endive	30 in.	18 in.	8 to 12 in.	½ to 1 in.	Feb. to Apr.	Apr. [July]
Horseradish	30 to 40 in.	24 to 30 in.	14 to 20 in.	3 to 4 in.	Early Spr.	Early Spr.
Kale, or borecole	30 to 36 in.	18 to 24 in.	18 to 24 in.	½ in.	Oct. to Feb.	Aug. and Sep. [Mar. and Apr.]
Kohl-rabi	30 to 36 in.	18 to 24 in.	4 to 8 in.	½ in.	Sep. to Mar.	Mar. to May
Leek	30 to 36 in.	14 to 20 in.	4 to 8 in.	1 in.	May to Sep.	Mar. to May
Lettuce	30 in.	12 to 18 in.	4 to 6 in.	½ in.	Sep. to Mar.	Mar. to Sep.
Melon, musk	6 to 8 ft.	6 to 8 ft.	Hills 6 ft.	1 to 2 in.	Feb. to Apr.	Apr. to June. (Start early plants in hotbed during Mar.)
Melon, water	8 to 12 ft.	8 to 12 ft.	Hills 10 ft.	1 to 2 in.	Mar. to May	May and June
Okra, or gumbo	4 to 5 ft.	3 to 4 ft.	24 to 30 in.	1 to 2 in.	Feb. to Apr.	May and June
Onion, seed	24 to 36 in.	12 to 18 in.	4 or 5 to ft.	½ to 1 in.	Oct. to Mar.	Apr. and May
Onion, sets	24 to 36 in.	12 to 18 in.	4 or 5 to ft.	1 to 2 in.	Early Spr.	Aut. and Feb. to May
Parsley	24 to 36 in.	12 to 18 in.	3 to 6 in.	1-8 in.	Sep. to May	Sep. and early Spr.
Parsnip	30 to 36 in.	18 to 24 in.	5 or 6 to ft.	½ to 1 in.		Apr. and May
Peas	3 to 4 ft.	30 to 36 in.	5 or 6 to ft.	2 to 3 in.	Sep. to Apr.	Mar. to June
Pepper	30 to 36 in.	18 to 24 in.	15 to 18 in.	½ in.	Early Spr.	May and June. (Start early plants in hotbed during Mar.)
Potato, Irish	30 to 36 in.	24 to 36 in.	14 to 18 in.	4 in.	Jan. to Apr.	Mar. to June
Potato, sweet	3 to 5 ft.	3 to 5 ft.	14 in.	3 in.	Apr. and May	May and June. (Start plants in hotbed during Apr.)
Pumpkin	8 to 12 ft.	8 to 12 ft.	Hills 8 to 12 ft.	1 to 2 in.	Apr. and May	May to July
Radish	24 to 36 in.	12 to 18 in.	8 to ft.	½ to 1 in.	Sep. to Apr.	Mar. to Sep.
Rhubarb, seed	36 in.	30 to 36 in.	6 to 8 in.	½ to 1 in.		Early Spr.
Rhubarb, plants	3 to 5 ft.	3 to 5 ft.	3 ft.	2 to 3 in.		Aut. or early Spr.
Rutabaga	30 to 36 in.	18 to 24 in.	6 to 8 in.	½ to 1 in.	Aug. and Sep.	May and June
Salsify	30 to 36 in.	18 to 24 in.	2 to 4 in.	½ to 1 in.		Early Spr.
Spinach	30 to 36 in.	12 to 18 in.	7 or 8 to ft.	1 to 2 in.	Sep. to Feb.	Sep. or very early Spr.
Squash, bush	3 to 4 ft.	3 to 4 ft.	Hills 3 to 4 ft.	1 to 2 in.	Spr.	Apr. to June
Squash, late	7 to 10 ft.	7 to 10 ft.	Hills 7 to 9 ft.	1 to 2 in.	Spr.	Apr. to June
Tomato	3 to 5 ft.	3 to 4 ft.	3 ft.	½ to 1 in.	Dec. to Mar.	May and June. (Start plants in hotbed during Feb. and Mar.)
Turnip	24 to 36 in.	18 to 24 in.	6 or 7 to ft.	¼ to ½ in.	Aug. to Oct.	Apr. [July]
Vegetable marrow	8 to 12 ft.	8 to 12 ft.	Hills 8 to 9 ft.	1 to 2 in.	Spr.	Apr. to June

Brackets indicate that a late or second crop may be planted the same season.

settled in 1760, and was part of Pittston until 1803; p. 6,044.

**Gardiner, or Gardener, Lion** (1579-1663), English settler, came to America as an engineer in 1635 to plan a town and fort (called Saybrook) for the company owning the tract of land at the mouth of the Connecticut River. In 1639 he purchased from the Indians a small island off the coast of Long Island which he named Isle of Wight, and which is now Gardiner's Island. This was the first English settlement within the present boundaries of New York State. He was granted full proprietary and baronial rights over the island, and succeeded in entailing it for nine generations. Consult C. C. Gardiner's *Lion Gardiner and His Descendants*.

**Gardiner, Samuel Rawson** (1829-1902), English historian. His principal work is practically a history of England from the accession of James I. to the end of the protectorate of Oliver Cromwell. The chief sections of his great work were *History of England from the Accession of James I. to the Outbreak of the Civil War* (10 vols., new ed. 1883-4); *History of the Great Civil War* (4 vols., new ed. 1893); *History of the Commonwealth and Protectorate* (3 vols., new ed. 1894-1903). In addition to these, he published many other works and edited the *Historical Magazine*.

**Gardiner, Stephen** (1483-1555), English diplomat, bishop of Winchester, was born at Bury St. Edmunds, and became secretary to Cardinal Wolsey. Sent as ambassador to Pope Clement VII. (1528), he obtained a second commission on the royal divorce question, thereby winning the favor of Henry VIII. Consecrated bishop of Winchester (1531), and employed on embassies to France and Rome (1531-2), he supported the divorce on national grounds. He did his share in the translation of the New Testament (1535); and Burnet's charge against him of having prevented the new translation (1542) has been amply refuted by Dixon (*Hist. of Church of England, II 285-289*). Having celebrated mass at Henry's obsequies, Gardiner was ousted from the council and the chancellorship of Cambridge, deprived of his see, and imprisoned in the Tower throughout Edward VI.'s reign. Liberated by Mary and made lord chancellor, he opposed the Spanish marriage, and advocated an English consort for the Queen. In the Marian persecutions he practically took no part, declaring strongly against them after the Calais conferences (1555). His endeavors to save the lives of

Cranmer and Northumberland are now admitted. Gardiner died in communion with Rome.

**Gardiner's Island**, at the eastern entrance of Long Island Sound, Suffolk co., New York, in the bay between Orient and Montauk Points. Treasure discovered here was supposed to have been buried by Captain Kidd.

**Gardner, Ernest Arthur** (1862-1939), English archaeologist. From 1887 to 1895 he was director of the British School of Archaeology at Athens. He became joint-editor of the *Journal of Hellenic Studies* in 1897, and wrote *A Handbook of Greek Sculpture* (1896-7; revised 1915). *Ancient Athens* (1902), *Six Greek Sculptors* (1910), and *Religion and Art in Ancient Greece* (1910).

**Gardner, Percy** (1846-1937), English numismatist and archaeologist, was born at Hackney, London. His numerous publications include *Samos and Samian Coins* (1882); *The Types of Greek Coins* (1883); *Oxford at the Cross Roads* (1903); *Practical Basis of Christian Belief* (1923).

**Gare-fowl, or Great Auk** (*Plautus impennis*), a flightless member of the bird family Alcidae, which inhabited the northern hemisphere, and was exterminated about 1844



Gare Fowl or Great Auk.

Owing to the shortness of the wings, the birds, although admirable swimmers, were incapable of flight. The most famous breeding-places were three islets off Iceland, and Funk Island, near Newfoundland. On Funk Island they were driven into 'pounds' constructed of stone, and slaughtered like sheep. The breeding-places near Iceland were destroyed by a volcanic outburst. The history of the exter-

mination of this great waterfowl is given in the Smithsonian Report for 1888.

**Garfield**, city, New Jersey, Bergen co. It has woolen and knitting mills, embroidery and stone works, and manufactures of clothing, boxes, rubber, paper, and chemicals; p. 28, 044.

**Garfield, Harry Augustus** (1863-1942), American educator, son of President Garfield, was born in Hiram, Ohio. He pursued graduate study, chiefly law, in Columbia, Oxford, and the Inns of Court, London. He practiced law in Cleveland, Ohio, in 1888-93, was professor of politics in Princeton University (1903-08), and in 1908 became president of Williams College, where he remained until his resignation in 1934. He also served as U. S. fuel administrator for President Wilson in 1917.

**Garfield, James Abram** (1831-81), American statesman, twentieth president of the United States, was born on Nov. 19, 1831, in Orange, Cuyahoga co., Ohio. He was the son of Abram Garfield, a farmer, and passed his boyhood on a farm, receiving little systematic schooling. At seventeen he went to Cleveland, and for a short time worked on a canal boat and afterward as a carpenter. He studied at a seminary in Chester, O., and at the Hiram (O.) Eclectic Institute, and in 1854 entered Williams College. He became professor of ancient languages and literature in the Hiram Eclectic Institute, serving as its president in 1857-61. During the Civil War he served with distinction in the army. From 1863 until 1881 he was a Republican representative in Congress. He took an influential part in the debates concerning the reconstruction of the Southern States, and advocated the impeachment of President Johnson. He was also prominent in matters of taxation and the currency.

Garfield's reputation, however, suffered greatly as a result of charges brought against him in connection with the Crédit Mobilier scandal to the effect that he had corruptly received from Oakes Ames the sum of \$329. The charge of corruption was never proved against him; but the figures '329' were used as 'a campaign cry.' In 1880 he was elected to the U. S. Senate, but before he could take his seat he was nominated for the presidency, as a Republican compromise candidate, and in November, 1880, was elected. Immediately after his inauguration he came into conflict with the Republican faction in New York known as the 'Stalwarts' on the question of patronage. On July 2, 1881, he was shot by

a fanatic, Charles Jules Guiteau, who had applied in vain to the President for an office. The President was taken to Elberon, N. J., where he died on Sept. 19. Consult Ridpath's *Life and Work of James A. Garfield*.

**Garfield, James Rudolph** (1865- ), American public official, son of President James A. Garfield. In 1905 and 1906 he made important reports on the 'Beef Trust,' and the Standard Oil Trust, and in 1907-1909 was Secretary of the Interior in President Roosevelt's cabinet. Since that time he has practised law in Cleveland, Ohio.

**Gargoyle**, in Gothic architecture the name given to a spout projecting from the gutter of a building, in order to carry the rain-water clear of the walls. Gargoyles are usually carved into different forms—animal, human, or grotesque, and are an interesting feature in ecclesiastical architecture. Some of the most famous are those on the Cathedral of Notre Dame at Paris.



*Some Quaint Gargoyles.*

**Garibaldi Giuseppe** (1807-82), Italian patriot, was born in Nice. He early became associated with Mazzini's movement for Italian liberty, and in consequence was forced to flee the country (1834). In 1848 he returned to Italy, leading a body of volunteers against the Austrians. Thence he went to Rome, then besieged by the French, and materially assisted in its defence. The breakdown of the popular movement sent him again upon his travels. He went to the United States and lived for a time in Staten Island, N. Y. In 1854 he settled on a small farm in the island

of Caprera (n.e. of Sardinia), whence he eagerly awaited the issue of Cavour's policy in Italy. He protested against the cession of Nice and Savoy, which Napoleon III. exacted from Cavour. In this same year he sailed from Genoa with the famous 'thousand volunteers,' and on May 11, 1860, landed at Marsala in Sicily, and within 26 days made himself master of Palermo. In two months he was at the head of 18,000 men, and his progress towards the capital (Naples) was a triumphal procession. Cavour endeavored to get possession of Naples before Garibaldi reached it; but Garibaldi was too quick for him, and entered the city on September 7. When, however, the Sar-



James Abram Garfield.  
Twentieth President of the United States.

dinian army of Victor Emmanuel appeared on the Neapolitan frontier, Garibaldi resigned his dictatorship and on Nov. 9, 1860, retired to Caprera. Lured by the dream of a united Italy, with Rome as its capital, he twice again called his volunteers to the task, but unsuccessfully. On the second attempt he met with a severe defeat from the papal and French troops at Mentana, near Rome, and was taken prisoner by the Sardinian government (Nov., 1867), and confined for some days near Spezia, whence he was permitted to retire once more to Caprera. His only other public act was his rather quixotic attempt to aid the infant French republic against the

Germans in 1870-1, when he headed a corps of French volunteers in Burgundy. Consult Marriott's *The Makers of Modern Italy*; Bent's *Life of Garibaldi*; Marlo's *Garibaldi e i suoi Tempi*; Melena's *Garibaldi*.

**Garigliano** (anc. *Liris*), river of Southern Italy, rises on the borders of Abruzzi, and flows for about 100 m. to the Gulf of Gaeta, on the Mediterranean. Near here in December, 1503, the French were defeated by the Spaniards under Gonsalvo de Cordova. Here the Chevalier Bayard made his famous defence of the bridge over the river.

**Garland, Augustus Hill** (1832-99), American public official, was born in Tipton co., Tenn., but soon after removed with his parents to Arkansas. He joined the Southern cause and was elected to the Confederate congress and afterwards to its senate, where he remained until the close of the war. In 1874 he was elected governor of Arkansas by a large majority, and in 1877 entered the U. S. Senate. He was re-elected in 1883, and in 1885 was appointed by President Cleveland attorney general of the United States. After his retirement in 1889 he practised law in Washington.

**Garland, Hamlin** (1860-1940). American author, was born in West Salem, Wis. He was educated at Cedar Valley Seminary, Osage, Ia., taught school in Illinois (1882-3) and in 1884 went to Boston and began his literary career. His first book, *Main Travelled Roads* (1890), was a volume of short stories. His work presents some forceful pictures of the development of the Middle West. Among his books are *Prairie Folks*, *Prairie Songs*, *A Son of the Middle Border* (1917), *A Daughter of the Middle Border* (1921), *The Book of the American Indian* (1923), *The Trail Makers* (1926), *Back Trailers of the Middle Border* (1928), *My Friendly Contemporaries* (1932).

**Garlic** (*Allium sativum*), an onion-like plant of strong flavor. It is a perennial and grows wild in the south of Europe, but is now commonly cultivated in nearly every country. The plant has a pungent acrid taste and a penetrating and offensive odor.

**Garner, John Nance** (1869- ), American public official, was born in Texas. Admitted to the bar in 1890, he was member of the Texas House of Representatives 1898-1902; member of Congress 1903-1932; elected Speaker of the House of Representatives 1931. In 1932, after resigning from Congress, he was elected vice president of the United States. He was re-elected, 1936.

**Garnet.** The garnets crystallize in the cubic system, usually as rhombic dodecahedra, and have a resinous lustre, a hardness of 7, a specific gravity over 3.3, and a very imperfect cleavage. Their color is mostly brown or red, but may be black, green, or yellow, and colorless crystals are sometimes found. The varieties pyrope (dark red), almandine (bluish red) and uvarovite (green) are semi-precious stones, and are used in jewelry, though they are not of great value. Pyrope, which was known to the ancients as 'carbuncle,' is abundant in some serpentines in Saxony and Bohemia.

**Garnet, Henry Highland** (1815-82), Afro-American clergyman, was born a slave at New Market, Md., of unmixed African descent. Escaping to the North with his parents, he received his education at Canaan, N. H., and Oneida, N. Y., graduating at the Onondaga Institute in 1840. After teaching at Troy, N. Y., he studied theology and was pastor of a Presbyterian church in that city from 1842 to 1852. For some time he edited an abolitionist paper, *The Clarion*. He was pastor of the Shiloh Presbyterian Church in New York for most of the time from 1855 to 1881, when he was appointed U. S. minister to Liberia by President Arthur. He took up his residence in that country, but died less than two months after his arrival.

**Garnierite**, a fibrous or amorphous silicate of nickel and magnesium, found in serpentine rocks in New Caledonia and in Oregon; valuable as a source of nickel. Its color is a fine apple green or emerald green, and it is always massive, granular, or concretionary, never crystallized.

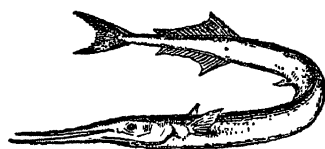
**Garnishment.** A legal process under which the personal property of a defendant in an action, in the possession of another, or his claims against others, are attached or seized by the officer executing the writ, and held, if chattels, or payment stopped, if credits or claims, pending the determination of the action, for the benefit of the plaintiff.

**Garonne**, riv. of France, rises e. of Maladetta, the highest peak in the Pyrenees, and flows generally n. to Toulouse through the dep. Haute-Garonne.

**Gar-pike.** (1.) A species of the fish genus *Belone*, which are common in temperate and tropical seas. The jaws are prolonged into a slender beak, by means of which the fish snap up the small prey on which they feed. (2.) The name is also given to the bony pike or billfish, a ganoid fresh-water fish of the genus *Lepidosteus*, found in America, where the

most common and widespread species is *L. osseus*.

**Garrard, Kenner** (1828-79), American soldier, was born in Cincinnati, and graduated at West Point in 1851. He served as instructor and afterward as commandant at West Point from Sept., 1861, to Sept., 1862, when he was exchanged. As colonel of the 146th N. Y. reg-



*Gar-Pike.*

iment, he took part in the battles of Fredericksburg, Chancellorsville, and Gettysburg. In Dec., 1864, he was brevetted major-general of volunteers and placed in command of the second division of the sixteenth army corps. For his conduct at the battle of Nashville, in the operations against Mobile, and as head of the storming column capturing Blakely, he was brevetted brigadier-general in the regular army. In Nov., 1866, he resigned from the regular army, and from 1871 until his death held expert municipal positions in Cincinnati.

**Garrett, Thomas** (1789-1871), American merchant and reformer, was widely known as a friend of the negro, and during his life aided about 3,000 fugitive slaves to gain their freedom. He was so successful in this work that slave owners usually abandoned pursuit when they found that the fugitives had sought refuge with him. In 1848 he was prosecuted and was fined so heavily as to ruin him financially; whereupon his Wilmington fellow citizens advanced him sufficient capital to renew his business.

**Garrick, David** (1717-79), English actor, manager, and dramatist. He appeared at Goodman's Fields, London, on Oct. 19, 1741, as Richard III., achieving an immediate and extraordinary success. From 1742 to 1746 he appeared at the Drury Lane Theater; and after 1747—when he became, with Lacy, joint proprietor—he played there for twenty-nine years more. Garrick elevated the whole tone of the stage; substituted for the old stilted and declamatory style one more vivacious and natural; and greatly increased the popularity of Shakespearean performances. His repertory included his own adaptations of French and English dramatists and plays by Buckingham, Cibber, and others. Lear has been accounted his greatest part; but by some he



has been judged to excel in comedy. His versatility was extraordinary, the rôle of romantic hero being perhaps the only one in which he failed to achieve supreme success. *Lethe* is the only play known to have been wholly of his composition. He wrote numerous prologues and epilogues of merit.

Consult his *Private Correspondence*, with Memoir; Hedgcock's *David Garrick and His French Friends* (1912).

**Garrison**, a collective term denoting the officers and men stationed at a military post or camp for the purpose of manning its defences, taking care of the property, as well as for drill and instruction. A Garrisoned Post is one occupied by troops.

**Garrison, Wendell Phillips** (1840-1907), American journalist, son of William Lloyd Garrison. From 1865 to 1906 he was literary editor of *The Nation*, in which position he exerted an immense influence on American literature. With his brother, Francis J. Garrison, he was joint author of *William Lloyd Garrison—The Story of His Life* (1885). He also published several memorial volumes, books for children, and *Sonnets and Lyrics of the Ever-Womanly* (1898). Consult *Letters and Memorials of Wendell Phillips Garrison* (1908).

**Garrison, William Lloyd** (1805-79), American reformer, and leader of the Abolitionists in the anti-slavery struggle, was born in Newburyport, Mass. His father, Abijah Garrison, a sea captain, deserted his family when William was only three years old. After a brief period of schooling, William was apprenticed, when nine years old, to a shoemaker and later to the Newburyport *Herald*, where he became an expert printer and foreman.

At the end of his apprenticeship (1826), Garrison engaged in various editorial enterprises. Jan. 1, 1831, appeared in Boston the first number of a paper of his own, the famous *Liberator*. Garrison's salutatory was characteristic: 'I will be as harsh as truth, and as uncompromising as justice. On this subject I do not wish to think, or speak, or write with moderation. I am in earnest—I will not equivocate—I will not excuse—I will not retreat a single inch—and I will be heard!' The *Liberator* soon attracted attention throughout the North, and caused consternation in the South, where the mere possession of a copy came to be regarded as a serious offence against the community. In December, 1831, he was indicted for sedition in North Carolina, while the legislature of Georgia offered a reward of \$5,000 for his conviction in accordance with

the laws of that State. On Oct. 21, 1835, a mob broke up one of his meetings in Boston, and he was so roughly handled that he had to be rescued by the police and lodged in jail for his own safety.

Garrison did not confine his anti-slavery propaganda to *The Liberator*. With all the intensity of his nature, Garrison believed slavery to be a heinous crime against humanity, and that slave owners were steeped in moral guilt. He did much to embitter the South against the North. Despite opposition, threats, and personal mistreatment he courageously persevered as the leader of the distinctively moral struggle against slavery. Upon the adoption of the Thirteenth Amendment he felt that his work was done, and he therefore discontinued *The Liberator*. In 1868 the sum of \$31,000 was raised for him by subscription as a 'national testimonial.' During his last years he supported various reforms, especially prohibition. Consult W. P. and F. J. Garrison's *William Lloyd Garrison—The Story of His Life Told by His Children*; Smith's *The Moral Crusader*.

**Garrote**, a method of execution which originated in Spain, and which was also formerly employed in the Spanish colonies. The word means literally stick, and the name was formerly appropriate, as this form of execution originally consisted in seating the victim in a chair with his neck against a post, then placing a rope around his neck and the post, and twisting it about the neck by means of a stick inserted in the rope back of the neck until strangulation was produced. This has been superseded by a device which forces a sharp point into the spinal column and causes instant death.

**Garter, The Most Noble Order of the**, a famous British order of knighthood, instituted by King Edward III., probably in 1344. The color of the emblem chosen was blue, the French livery color, and the motto, *Honi soit qui mal y pense*. The often cited tradition as to emblem and motto is that the Countess of Salisbury dropped her garter when dancing with the King, and the King, picking it up, tied it round his leg; but observing the Queen's jealous glances, he returned it to its fair owner with the remark, '*Honi soit qui mal y pense*' ('Dishonored be he who thinks ill of it').

**Garter Snakes**, a genus of non-poisonous snakes common throughout the United States, and found also in Southern Canada, Mexico, and as far south as Guatemala. They vary in size and color. A large specimen is about three

feet long and one inch thick in its greatest diameter, and the usual pattern is three light stripes on a darker ground—one along the middle of the back and one on each side. The ventral surface is usually slate colored. Garter snakes inhabit swamps, woods, rocky fields and grassy meadows, and feed upon earth worms, tadpoles, fish, frogs, toads, small mammals, and birds. Some species are semi-aquatic. In the northern parts of their range they hibernate from December to March, and are gregarious in the winter and spring, during the breeding season. The eggs are hatched within the body of the mother, and the young,  $5\frac{1}{2}$  to  $7\frac{1}{2}$  inches long, which may number from 30 to 50, are independent from birth. They are produced usually in late summer, mature in a year, and breed the following spring. Consult *Bulletin No. 61* of the U. S. National Museum (1908), and Ditmar's *Reptiles of the World*.

**Garuda**, in Indian mythology, the creature on which Vishnu rides. It is half man and half bird, and has the head, wings, beak, and talons of an eagle. The body and limbs are human, the face is white, the wings red, and the body golden. Garuda is the lord of all birds and the implacable foe of snakes, which are his half-brothers.

**Garvice, Charles** (1833-1920), Eng. novelist, is known chiefly for his popular novels and plays, which he produced to the number of more than a hundred. His novels include *Nance* (1900); *Just a Girl* (1902); *Love Decides* (1904); *Love the Tyrant* (1905); *Diana and Destiny* (1906); *The Gold in the Gutter* (1907); *Kyra's Fate* (1908); *The Scribblers' Club* (1909); *Barriers Between* (1910); *The Heart of a Maid* (1910); *The Lady of Darzacout* (1911); *Adrien Leroy* (1912); *Two Maids and a Man* (1912).

**Gary**, city, Indiana, in Lake co., on the southern shore of Lake Michigan. The greater part of the site was bought by the U. S. Steel Corporation in 1906, which proceeded to establish here large steel works and other industries, and a model town for its employees. The location is well adapted for a great industrial center, being between the coal fields of the East and the iron mines of the West. It is named for Elbert H. Gary, the financier. The Gary Plan of education developed here attracted widespread attention; p. 111, 719.

**Gas.** See **Gases**; **Gas Lighting**; **Gas Manufacture**.

**Gas, Acetylene.** See **Acetylene**.

**Gas Burners.** For many years the gas burners chiefly in use were the *Batwing*

*Burner*, with a slit across a hemispherical head; the *Fishtail Burner*, with two holes converging toward one another; and the *Argand Burner* with a circle of holes. All such burners, however, are economically inferior to the *Incandescent Burner*, first invented by Auer Von Welsbach, and have been largely supplanted by the latter. The Welsbach is a Bunsen burner over the flame of which is fitted a mantle consisting of thoria and a little ceria, emitting a brilliant white light on incandescence.

The *Multiple Flat-Flame Burner* is a group of three or five batwing or fishtail burners arranged in a circle. The *Regenerative Burner*, as recently improved, has an annular flame surrounding a central porcelain cylinder. The *Albo-Carbon Burner* affords a soft, steady, and very white light by the addition to the gas, as it enters the flame, of hot vaporized carbon from a receptacle in the burner.

**Gascoigne, George** (c. 1535-1577), English poet and dramatist. About 1572 his poems were published and he wrote some plays which were produced. He had a share in devising the masques which celebrated Queen Elizabeth's visit to Leicester. His works include: *A Hundred Sundry Flowers* (1572), enlarged as *Posies* (1575); *A Glasse of Government* (1575); *The Steele Glas* (1576); *The Complaynte of Phylomene* (1576); *Princely Pleasures at the Court of Kenilworth* (1576). Consult Schiller's *Life*.

**Gascony** (Latin *Vasconia*), an ancient district in Southwestern France, situated between the Bay of Biscay, the River Garonne, and the Western Pyrenees. Gascony derived its name from the Basques or Vasques, who, driven by the Visigoths from their own territories on the southern slope of the Western Pyrenees, crossed to the northern side of that mountain range in the middle of the sixth century, and settled in the former Roman district of *Novempopulana*. The inhabitants, numbering about a million, have preserved not only their dialect and customs, but even their distinct individuality alike in outward aspect and in their good temper. The Gascon is little in stature and thin, but strong and lithe in frame, with fine eyes and high color. He is ambitious and enterprising, but passionate and given to boasting and exaggeration. Hence the name *Gasconade* has gone into literature as a synonym for harmless vaporizing.

**Gas Engines** are engines in which the motive power is obtained by the combustion of an explosive mixture of gas and air inside the motor cylinder. Hence they belong to the

class of 'internal combustion' engines, in contradistinction to steam engines, in which the working agent—steam—is produced separately. They are similar in principle to Oil Engines, except that in the latter a mixture of oil vapor and air is used for combustion.

The four-stroke cycle of Beau de Rochas and Otto, commonly known as the Otto cycle, may be best followed in that which represents a longitudinal section of an Otto cycle gas engine in diagrammatic form. In modern engines the inlet valve is usually at the top of the combustion chamber opposite the exhaust valve, but inverted. During the first forward or *charging* stroke of the cycle, gas and air are drawn into the cylinder by the suction of the piston. On the return or *compression* stroke the mixture is compressed into the clearance space, which is usually about 30 per cent. of the working volume of the cylinder. The charge is then ignited as the crank reaches a dead point, an explosion takes place, and the third or *working* stroke is performed under the pressure of the heated products of combustion. During the next return or *exhaust* stroke the above products are expelled from the cylinder into the atmosphere. Thus to complete the action requires four strokes of the piston, or two revolutions of the crank shaft.

In the Westinghouse engine of the vertical type, there are two or three cylinders, and the Beau de Rochas (four stroke) cycle is used in each cylinder, but in alternation.

The OLDS, ALLIS-CHALMERS (modified Nürnberg), TOL, and ALBERGER engines follow the usual type, with minor modifications.

See OIL AND GASOLINE ENGINES; DIESEL ENGINE.

**Gases.** A gas is an invisible, transparent substance of low specific gravity, offering little resistance to the passage of bodies at low speed through it. An example is *air*, which is a mixture of a number of gases, principally nitrogen, oxygen, water vapor, argon, and carbon dioxide. A gas expands indefinitely in all directions; hence has no inherent bounding surface, and must be completely enclosed, and is said to exert pressure.

Most gases are colorless; some are colored, as chlorine (greenish yellow). Many have characteristic odors, as ammonia; some are odorless, as hydrogen. Considerable diversity of physiological effect is shown among gases. Some are indifferent, as nitrogen; some irritating, as sulphur dioxide (formed when sulphur burns); some anesthetic, as nitrogen monoxide (laughing gas); some poisonous, as

carbon monoxide; while oxygen is necessary for the maintenance of life processes.

Chemically, gases may be elementary, as oxygen, or may be compounded of two or more elements, as carbon dioxide. They may react with each other, as hydrogen chloride and ammonia when brought in contact, forming ammonium chloride (sal ammoniac); or with other suitable chemical reagents, as burning sulphur, which is the chemical union of sulphur with the gas oxygen, forming sulphur dioxide. Many liquids and solids may be converted into gases by application of heat, by diminution of pressure, or by both; hence substances which have an appreciable vapor pressure at the prevailing temperature will be present in the gaseous state. A vapor is to be distinguished from a gas; vapor is readily converted to liquid either by lowered temperature or increased pressure. Gas is not.

The effect of increasing the temperature of a gas is to increase its volume, or expand it; while decreasing the pressure to which a gas is subjected decreases the volume, or contracts it. Hence, in stating the volume it is always necessary to mention the temperature and pressure at which the given mass of gas occupied the stated volume. For scientific purposes the temperature  $0^{\circ}$  C. (at which ice melts) and 760 mm. (about the average barometric pressure) are taken as standard conditions to which to refer gases for measurement. Among the many physical constants pertaining to gases, which serve to distinguish them, density and specific gravity are in frequent use.

The *absolute density* is the weight of one cubic centimeter at  $0^{\circ}$  C. and 760 mm. The *relative density* is the ratio of the weight of a given volume at  $0^{\circ}$  C. 760 mm., to an equal volume of hydrogen at the same temperature and pressure. The *specific gravity* is the ratio of the weight of a given volume at  $0^{\circ}$  C., 760 mm., to the weight of an equal volume of dry air at the same temperature and pressure.

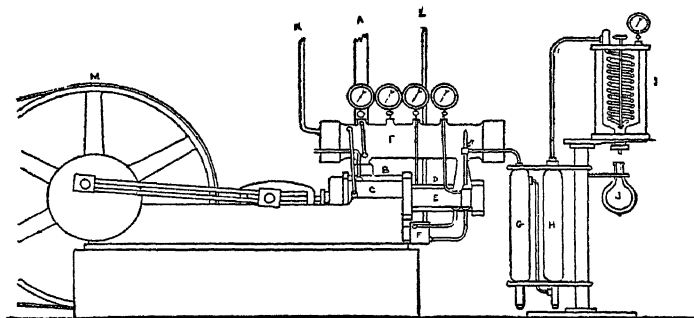
A gas may be liquefied when its temperature is below its critical point, if it is subjected to those conditions that cause the condensation of any vapor. These conditions are simply that the external pressure should be larger than the vapor pressure of the liquid; a state of affairs that can be attained in two ways—*viz.*, by increasing the external pressure by compression pumps, or by decreasing the vapor pressure by cooling.

According to these principles, gases of which the critical point is above ordinary temperatures can be liquefied by compression.

sion alone, though the pressure required may be reduced by cooling; while those of low critical point must be cooled, and are usually liquefied at atmospheric pressure. The method of compression is still used for the commercial preparation of liquid sulphur dioxide, carbon dioxide, nitrous oxide, etc., which are sold as liquids in strong steel cylinders.

The production of the gases that are with the greatest difficulty liquefied, even in large quantity, was effected by the application of a discovery of Joule and Lord Kelvin, that when a gas is forced through a small aperture or porous plug it is perceptibly cooled.

at the jet reaches the liquefying point, a large proportion of air liquefies, trickles down, and is collected in a 'vacuum vessel,' or vessel with double walls, from between which the air is exhausted as perfectly as possible. By working in this way, with a three-horse-power motor driving the compression pumps that deliver the air at 170 atmospheric pressure, liquid air is obtained in about four minutes, at a rate of about 1 to 1½ quarts per hour. One of the well-known commercial uses of the liquefaction of gases is in mechanical refrigeration—for cold storage, making ice, and air conditioning.



*Liquid Air Machine.*

A, Intake; B, compression of cylinder to 100 lbs. per. sq. in., C, to 200 lbs., D, to 1,000 lbs., E, to 3,000 lbs.; F, intercoolers; G, water and oil drip; H, potassium hydroxide; I, Linde liquefier; J, Dewar flask; K, inlet water-cooling system; L, outlet water-cooling system; M, belt from motor or power shaft.

Apparatus on this principle has been devised in which the effect is combined with the regenerative principle—i.e., the cooled gas passes out alongside the entering gas, so that the latter is cooled to the temperature of the former. The temperature of the expanding gas thus becomes lower and lower, until liquefaction takes place, at a pressure only very slightly above that of the atmosphere. The apparatus itself is of the simplest description, compressed purified air furnished by a pump, or even a cylinder of compressed air, being led through spirals of copper tube wound co-axially round a central spindle that controls the opening of the jet at which the compressed air escapes. After expansion the cooled air flows out either over the outside of the spirals, or through concentric ones, cooling the incoming gas so effectually that the final temperature of the escaping gas is only a degree or so lower than the temperature of that entering. When the temperature

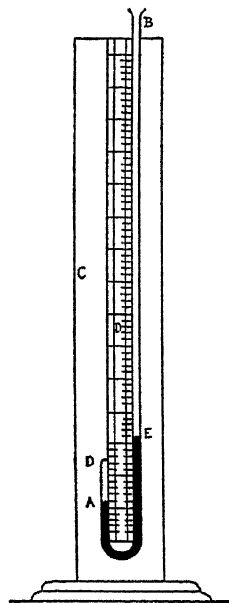
Consult Hardin's *Rise and Development of the Liquefaction of Gases*; Travers' *Study of Gases*; and publications of the various conferences on refrigeration.

**Gases, Laws of.** The most important laws of gases are those which relate to the effects on them of pressure and temperature changes. Two peculiarities characterize gases in this respect: 1. When a given quantity of gas is brought to a definite pressure and temperature, there is no ambiguity as to its other properties, as, for instance, volume, internal energy, entropy. 2. Gases are extremely susceptible to changes of volume under the effects of increase of pressure, or temperature. In other words, their compressibilities and coefficients of expansion are relatively very great.

**BOYLE'S LAW.**—When the temperature of a gas is kept constant, and its volume changes, the resulting pressure and density are such that one is proportioned to the other. This

law is only approximate. It was proved in 1662 by Robert Boyle and later by Mariotte.

**DALTON'S LAW.**—When several gases are placed in the same container, they mix and they are distributed uniformly, so that the mixture is everywhere the same; and the sum of the pressures which the respective gases would exert on the wall if each were alone in the container is equal to the total pressure of the mixture on the wall. This



*Boyle's Law Apparatus.*

law is not exact. The statement holds best for moderate pressures. This law must be applied whenever a gas is measured over water, on account of the water vapor necessarily present.

Diffusion also takes place between two gases when they are semi-separated by partitions with minute apertures, such as exist in cracked glasses or in unglazed clay and porcelain—different gases diffusing, as discovered by Graham, at rates that are inversely proportional to the square roots of their densities. As a consequence, differences of pressure result in those cases where a porous partition is employed that offers considerable resistance to the free flow of gases in the ordinary way, one gas passing in one direction more rapidly than the other gas moves in the opposite direction.

Effusion of gases is the process in which a

gas escapes through a minute hole under the influence of difference of pressure, and is the phenomenon that brings about a state of equilibrium.

**GRAHAM'S LAW OF EFFUSION** states: Rates of effusion are inversely as the square roots of the densities of the gases if the pressure conditions are the same, and are directly as the square root of the pressure differences if they are different.

The phenomenon of effusion has been employed by Bunsen to compare the density of a gas with that of another gas of known density. A burette-shaped vessel contains the gas experimented on, the lower and open end being immersed in mercury in a tall cylinder.

Liquids have the power of absorbing and retaining gases, the solubility varying with the temperature and pressure. In general, solubility decreases with increase of temperature; but the variation is different for different gases, and is not proportional. The variation with pressure, at constant temperature, of gases moderately soluble, and at pressures not exceeding a few atmospheres, can be expressed thus, as **HENRY'S LAW**: The weights of a gas dissolved in a given quantity of a liquid are proportional to the pressures. From this and Boyle's Law it follows that the *volume* of the gas that can be dissolved is the same for all pressures. In carbonated or 'sparkling' waters the gas (carbon dioxide) is dissolved at from two to three atmospheres pressure. When the pressure is released, the excess of gas over that soluble at the lower pressure is liberated, producing the effervescence.

If any flat solid be moved over another, there is a mutual force tending to prevent this motion. There is a similar action in liquids and gases tending to retard the motion of one layer of the liquid or gas relative to that next to it. But whereas this action in solids is explained by friction, in the case of gases it is said to be due to the interchange of molecules between the two layers.

Almost every solid body possesses the property of condensing gas as an invisible but very tenacious film over its surface. Thus, it is impossible to remove completely, even by the most efficient air pump, the film of air from a vacuum tube. The process is made more effectual, however, if the tube be strongly heated. Even then it has been found necessary to 'wash' out the tube repeatedly with hydrogen if it is required to have the oxygen completely removed.

**Gases, Liquid.** See **Liquid Gases**.

**Gases, Poisonous,** are of two types: gases such as carbon monoxide, which are poisonous of themselves, causing death when breathed in an atmosphere containing as little as one per cent.; and asphyxiating gases, as chlorine, bromine, and others.

The employment of poisonous gases for military purposes was known in ancient times, one of the earliest recorded instances of their use being in the Peloponnesian Wars of 431-404 B.C. They had little application in modern warfare prior to the world war, and they were condemned by The Hague Conference of 1899, though the United States failed to subscribe to the clause prohibiting their use. Among the gases employed are chlorine, bromine, formaldehyde, nitrous vapors, sulphurous anhydride, nitrogen peroxide, and carbon monoxide.

The most usual form of offence is the cloud attack, and the gas which appears to be most commonly employed is chlorine, either alone or in combination with bromine or phosgene. The gas, being much heavier than air, remains close to the ground, and is propelled rapidly toward the enemy under the influence of a favorable air current. Under proper atmospheric conditions it is effective over a distance of one and a quarter m. and in an atmosphere of which it forms but one part in 1,000.

**Gas, Fuel.** See **Fuels.**

**Gas Furnaces.** See **Furnaces.**

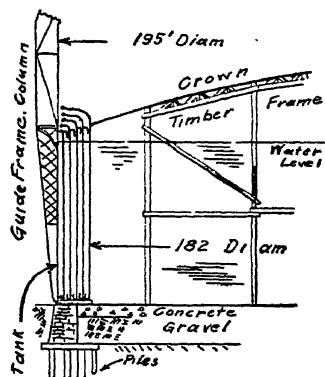
**Gas Heating.** See **Heating.**

**Gas Holder,** a metallic shell, open at the bottom, like a bell, the lower edge dipping into a deep tank of water which prevents the contained gas from escaping. The framework may be either of steel or timber—the latter being preferred for the largest holders. As the inverted holder shell floats in unstable equilibrium, with the weight of the crown at the highest point, some external guide structure is needed to keep the bottom edge parallel to the water surface in the tank and to resist the overturning force of the wind. This makes necessary three distinct parts to a gas holder—tank, holder shell, and guide frame.

To avoid the excavation of a large amount of earth, a system of making the gas holder in several telescoping, ring-like sections has been adopted. To prevent the escape of gas between the several sections, lutes or channels to contain water are provided; and these form concentric cupped rings which pick up water from the tank as they rise from it, the next larger cylinder having a corresponding grip or inverted cup fitting into the cup that

contains the water. In this way, gas holders may have as many as six lifts, holding up to 15,000,000 cubic feet.

The guide frames are latticed steel columns, diagonally braced, and forming a light but strong guide cylinder. The columns are really vertical cantilever beams, arranged circumferentially around the tank, and extending upward to above the top position of the filled holders, to carry guide rails for the rising and



Partial Section of Typical Large American Gas Holder.

(A 5,000,000 Cubic Foot Holder in New York City.)

falling shell. Guide rails are also carried by the tank inside for the bottom rollers of the outer shell; and on these rails, extended upward and held by the guide framing, are borne the tops of the rising shells through rollers on 'goose necks.' The bottom of each shell carries rollers which bear on the inside of the next outer shell, to maintain alignment. A pipe from the generating plant runs under the tank, and up through it to above the water level; another pipe connects with the service mains through the necessary control valves. The pressure of the gas holder has to be governed and regulated to that suitable for lighting and heating purposes.

**Gas, Illuminating.** See **Gas Manufacture; Gas Lighting.**

**Gaskell, Elizabeth Cleghorn** (1810-65), English novelist. She studied working men and women from the life, and devoted her days and nights to teaching them and relieving their distress. *Mary Barton* (1848), a novel of factory life, made her famous. *Cranford* (in *Household Words*, 1851-3) was a series of exquisite studies of village life. Then followed *Ruth* (1853); *North and South*

(1854); *Lizzie Leigh* (1855); *Life of Charlotte Brontë* (1857), which caused much controversy; *My Lady Ludlow* (1859); *Sylvia's Lovers* (1863); *Cousin Phillis* (1865). She had some measure of almost all the gifts of the great novelist—deep and genuine pathos, a singularly genial and truthful humor, a graceful and unforced style, power of description, dramatic faculty on occasion, and sympathetic insight into character. Consult Mrs. Chadwick's *Mrs. Gaskell: Haunts, Homes, and Stories* (1910).

**Gas Lighting.** The light-giving quality of a gas flame depends upon the liberation of particles of carbon within the flame, and their subjection to heat sufficient to raise them to incandescence. Gases used for lighting, therefore, are either naturally rich in hydrocarbons—as in coal gas—or the hydrocarbons are added artificially—as in water gas. By the chemical action which takes place in the flame the free hydrogen in the gas unites with the oxygen of the air at high temperature, decomposing the hydrocarbon gas, and setting free the carbon in minute particles which glow in the intense heat. If too much air is admitted, however, the carbon also is oxidized, and the flame becomes non-luminous, as in the Bunsen burner.

The gas commonly distributed by public service companies for lighting, heating, and cooking is either natural gas, coal gas, or water gas.

*Coal gas* is produced by destructive distillation of bituminous coal.

*Water gas* is a mixture of carbon monoxide, methane, carbon dioxide, and nitrogen, made luminous by the addition of gas made from oil.

*Natural gas* consists chiefly of methane, or 'marsh gas' and it has high heating capacity, though of low illuminating value. Natural gas is found in a great variety of rocks and is usually associated with deposits of petroleum. Its use has been increasing steadily with the additional application of gas to various industries. Other kinds of gas are used.

*Liquid Gas*—the liquefied heavy or 'wet' gases of oil wells—is distributed in steel cylinders holding an equivalent of 1,200 cubic feet of gas; and these may be connected to ordinary house piping. This gas does particularly well with mantles; and it has proved the cheapest of all illuminants, measured by candlepower hours.

*Blau Gas* is a liquefied coal gas into which are dissolved some of the permanent gases.

*Pintsch Gas*, used principally in the light-

ing of railway trains, is a mixture of the gases produced by decomposing petroleum.

*Acetylene Gas*, formerly used only for detached lighting plants, is now employed for town lighting as well.

**Risks.**—The risks of gas lighting are twofold—explosion and poisoning. Explosion cannot occur until there is from 7 to 8 per cent. of gas in the air; but it is dangerous to 'look for a leak with a light,' as the highest explosive percentage is always near the leak. In the case of poisoning, the gas must escape into a room until there is about one-half of 1 per cent. of carbonic oxide in the air of the room, before danger to life becomes imminent; and this percentage is rarely attained by ordinary escapes into rooms of fair size. Fatal accidents are usually caused by escapes into small rooms, or by the passage of gas from broken mains through the earth into the basement of a house, whereby the gas becomes deodorized, and thus escapes notice.

Consult Hole's *Distribution of Gas* (1912); Davidson's *Gas Manufacture*; and *Proceedings of The American Gas Association*.

**Gas Mantles.** The process of manufacture of mantles whose incandescence produces the light with Welsbach burners is as follows: (1) knitting a textile form; (2) saturating this form with certain earthy salts; (3) removing the textile form; (4) providing a temporary support for the fragile mantle during transportation.

A recent development is the use of artificial (synthetic) silk as the fibre from which the mantle is knitted. It is claimed that these mantles give a radiation equal to the best ramie mantles, and have about six times the latter's durability.

**Gas Manufacture.** In 1739 Dr. John Clayton described the experimental production of inflammable gas from coal heated in an enclosed vessel; but it was not until 1797 that its practical value as an illuminant was demonstrated by William Murdoch who used coal gas for lighting his premises at Old Cumnock, Ayrshire. The experiments of the Frenchman Lebon in Paris, 1799, had attracted the attention of Frederick A. Winsor, called 'the father of modern gas lighting,' who took up the study of the subject. In 1815 London had three plants and 15 m. of mains. Paris was similarly lighted in 1820, and thereafter the use of illuminating gas extended rapidly.

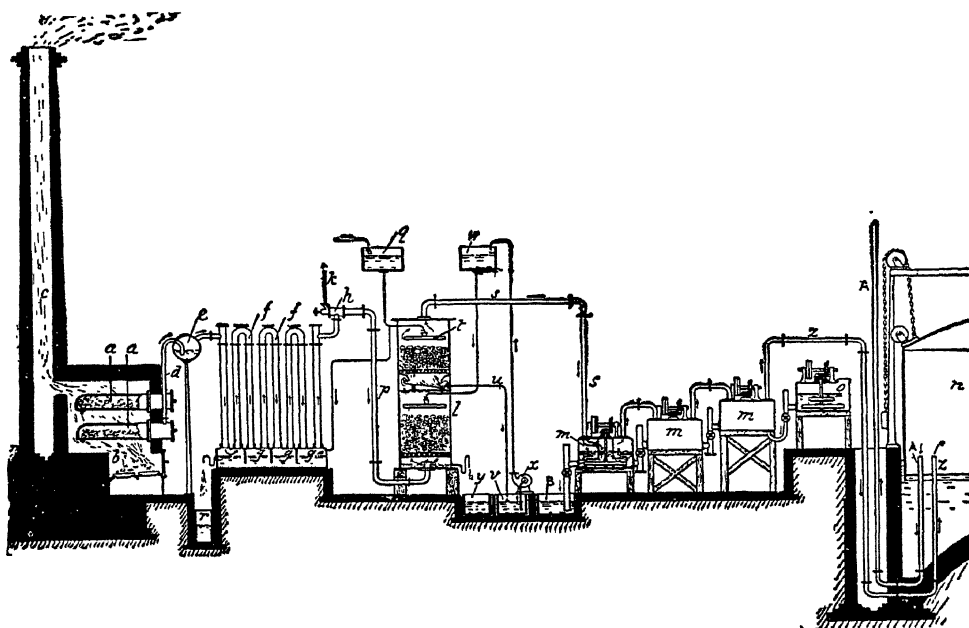
In the United States, its manufacture dates definitely from 1813, in Newport, R. I. Gas for street illumination was introduced into

Baltimore in 1821, into Boston in 1822, and into New York City from 1823 to 1827.

**COAL GAS.**—The manufacture of coal gas consists primarily in the destructive distillation of the coal by heat, causing it to give off its volatile constituents, leaving the solid carbon and ash in the form of coke. These volatile or gaseous constituents have then to be purified, or, in other words, to have those gases or solids removed which might be de-

air admitted below the grate is just sufficient to convert a considerable portion of the fuel into combustible carbonic oxide, which is burned among the retorts by the secondary or preheated air issuing from the ports of recuperators situated in the walls between the benches. The burned gases are then taken by flues to a smokestack.

When the retorts have been heated, coal is charged into them, and a temperature of



*The Manufacture of Coal Gas.*

*a, a*, Retorts; *b*, furnace; *c*, chimney; *d*, pipe from retort to hydraulic main *e*; steam supplied to exhaustor *h* by pipe *k* creates a partial vacuum in condenser *f*, and draws gas from *e* through *f*, and through the pipe *p* to the scrubber *l*; the coal tar and other impurities condensed in *f* fall into water tanks *g, g*, which receive fresh water from tank *q*, while the saturated liquid is drawn off into *r*. In the scrubber *l* the gas passes upward through the coke which it contains, saturated with water from tank *q*, sprinkled by a mechanical sprinkler *t*, and thus ammonia and other impurities are removed. The water from the upper part of the scrubber flows by pipe *u* to tank *v*, where a pump *x* raises it to the tank *w* to supply the sprinkler of the lower part of the scrubber. The gas next passes through the purifiers *m, m, m*, by pipe *s*, where it is in contact with a mixture of lime and water from the mixer *o*, agitated by mechanical means. Finally, it passes by pipe *z* into the gas holder *n*, and is drawn off by pipe *A* for use.

leterious to the illuminating power, harmful to health if consumed with the gas, or which may be more valuable when employed for other purposes.

The distillation takes place in closed vessels called *retorts*. They are set in groups or 'benches' of six to twelve, and heated by means of gas from a producer furnace. The

about 1,400° F. maintained after closing the end of the retort with a cover or lid. The volatile constituents of the coal are thus given off, and escape through a vertical pipe, connected to the top of the end of the retort projecting beyond the bench, called the standpipe; at the top of this standpipe curves downward (bridge pipe) through



a closed trough or hydraulic main partly filled with water, the pipe dipping into it so that the gas bubbles through and cannot get back again; in fact it is drawn through by an exhausting blower situated at the end of the foul main connecting with the hydraulic main. Thus there is always a slight vacuum on the retorts to prevent gas escaping through cracks into the fireplace.

After four or five hours of heating at about  $1,400^{\circ}\text{F.}$ , during which about 4.8 cubic feet of gas have been driven off per pound of coal, the lid is opened, the coke dropped, raked, or pushed out, and quenched with water. There usually remains an adherent deposit of graphite in the retort, which is burned off periodically or loosened and used to make electric light carbons. The quantities of the various products from the destructive distillation of a ton of coal are: gas, 10,000 cubic feet, or 17 per cent.; tar, 10 gallons, or 5.1 per cent.; virgin ammoniacal liquor, 7.9 per cent.; coke, 70 per cent.

The gas bubbling through the water in the hydraulic main deposits most of the tar and oily vapor it contains, cools down to  $150^{\circ}\text{F.}$ , travels through the primary (air-cooled) condenser, the foul main, the exhauster, tar extractor, secondary (water-cooled) condensers, ammonia washer, scrubber, purifier boxes, gas station meter, and then to the gas holder, whence it goes into the gas pipes or mains to the users of gas in the city. The tendency in newer machinery is to combine the parts of the cleaning system into fewer pieces of apparatus, resulting in simplicity and easier operation.

Both tar and ammonia are salable gas works by-products. The tar is either distilled by special works into pitch, heavy oils, and light oils which are further made into coal-tar products, or it is used in its crude state for pavements, painting roofs, making tarred paper, laying dust on roads, or more frequently burned by spraying into boiler furnaces with a steam jet. The ammonia liquor, of standard concentration, is sold to chemical works and principally converted into sulphate of ammonia for fertilizing purposes. Oxide of iron is generally employed to remove sulphuretted hydrogen from gas. The carbon disulphide and carbon dioxide are generally washed out before reaching the purifier boxes, which are nothing but large, covered, low boxes containing grid trays upon which the oxide of iron is placed. This oxide consists of iron turnings and borings from machine shops, left exposed to water and air until thoroughly rusted (of-

ten with addition of sal-ammoniac water to hasten the process), with which is mixed wood or cork shavings, sawdust, or, better, ground corncobs, over the surface of which the oxide spreads, and the sulphuretted hydrogen of the gas, uniting with it, forms sulphide of iron. The covers of the purifiers are usually made with sides, which fit when lowered into position into grooves or channels around the purifiers containing water, thus sealing them and preventing the escape of the gas. They are also clamped down on rubber packing. In the large works there are rotary scrubbers to remove cyanogen and naphthaline. The gas is now completely purified, and is passed through a meter for recording the volume to a holder. It is in this form that it passes from gas holders or tanks through the gas mains laid under the streets, through the service pipes connecting these mains to the consumer's premises and meter, and through this to the gas appliances.

**WATER GAS.**—The reaction of dry steam upon heated fuel was discovered by the French chemist Lavoisier toward the end of the 18th century. Water gas has been made commercially successful, due to the inventions of Prof. T. S. C. Lowe. Upon passing superheated or dry steam through incandescent carbon the oxygen combines with the carbon and  $\text{CO}_2$  is formed, liberating hydrogen; the  $\text{CO}_2$  in passing over the incandescent carbon is converted to CO. Consequently, water gas is theoretically a mixture of CO and H. But these gases have little illuminating power, although they are capable of giving out a considerable amount of heat when ignited; so that, for lighting purposes, they have to be carburetted, or loaded with hydrocarbons, which, carried forward by the diluent gases to the burners, can be made to give better light where required. The name Water Gas is misleading, and has caused many people erroneously to believe that the chief constituent of the gas is water. This error arises from the fact that superheated steam enters into the process of manufacture.

Water gas owes the peculiar whiteness and brilliancy of its light principally to its high flame temperature, whereby the carbon particles set free during combustion are heated to an extreme degree of incandescence. The efficiency of the 'fixing' process, using oil, in the modern Lowe apparatus is such that a gas of very high illuminating quality can be economically manufactured, and the illuminants will all be utilized at the burner without loss from condensation, or trouble with smoky

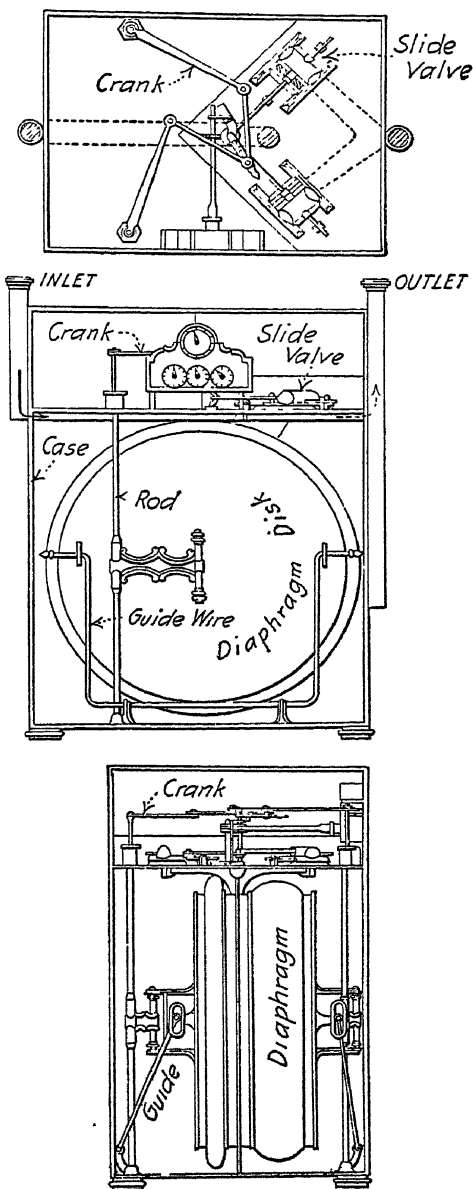
flames; whereas with coal gas any attempt to make a much higher candle power than 20 will result in condensation and smoky flames.

**COKE-OVEN GAS.**—In the United States, the by-product coke oven was first adapted for the manufacture of illuminating gas at Everett, Mass., by using the Otto-Hoffmann ovens and separating the gas into two fractions. In a by-product coke-oven plant the method employed for saving the gas is as follows: The gas given off from the coal during the coking operation is led away from the oven through uptake pipes, furnished with valves, to the gas-collecting mains. If the surplus gas is to be used for fuel purposes, only one gas-collecting main is needed; but if it is required to make illuminating gas, two are used—the additional one to take the portion of the gas delivered during the first part of the coking time, known as the 'rich' gas. This fraction is higher in calorific and illuminating value than the last portion of the gas, and therefore better suited for distribution purposes. The last portion of the gas is led off into the fuel gas mains, and after being freed of tar and ammonia is used for heating the ovens. The two portions of gas are kept absolutely separate through the subsequent cooling and condensing operation, the condensing house being so arranged as to handle them in separate systems, usually arranged in parallel. By this method, gas of a higher candle power can be obtained than if the coal were distilled in the ordinary manner in coal-gas retorts. Other gases manufactured include oil gas, oil producer gas, and Mond gas, a variety of water gas.

**PRODUCER GAS** is obtained by means of the decomposition of water or steam in contact with incandescent carbon. The first chemical reaction obtained is the formation of carbonic acid and the liberation of hydrogen; then carbon monoxide, a non-luminous gas, but one which possesses high calorific power, is formed. The principle involved in the preparation of this gas is that a jet of steam and air is passed through the generator containing coal or tar. Consult *Humphreys' Construction and Maintenance of Small Gas Works* (1911); *Dennis' Gas Analysis* (1913); *Davidson's Gas Manufacture*; and *Proceedings of the American Gas Association*.

**Gas Meters.** Gas supplied is measured by meters—large ones at the plant, and small ones on the customer's premises—of which there are two chief varieties, the Wet and the Dry. Though improved in details and workmanship, there has been little radical change

in meter designs, and most meters of today are similar to those of earlier days. Consumers' meters are made in a wide range of capac-



Front, Side and Top Views of Dry-Type Gas Meter.

ities, rated according to the number of burners supplied (allowing about 6 cubic feet per hour per burner). The smallest are known as

the 'two-light'; the largest are '100-light' and over.

**WET METERS.**—The wet type was the first, dating back to the invention of Samuel Clegg in 1815; and still continues in favor for large stations, where the meter is under constant scrutiny. In a wet meter there is a hollow cylinder mounted on an axis, and submerged in a box to a little above the axis. This cylinder is divided into three or more helical chambers by partitions. The cylinder has an annular cover at the front end, forming an inlet chamber communicating with all the measuring chambers before submersion. A bent tube, coming from the intake valve box and discharging above the water level, brings gas to the inlet section, whence it goes to the measuring chambers.

The gas enters one of these chambers at one end through an opening exposed above the water level during part of a revolution. When this opening is exposed, the outlet opening is under water and sealed. As the gas is forced in, it exerts pressure down in the water and upward on the measuring chamber wall, turning the cylinder partly around. As the inlet of one chamber disappears under water, the inlet of the next is exposed to incoming gas. The gas in the first chamber finds a possible outlet at its opposite end, through an opening which begins to emerge above water level. As the cylinder goes on rotating, water enters the first chamber and gas leaves it, and so on. The axle, thus made to rotate in proportion to the amount of gas delivered, works a train of gears which, by means of pointers and dials, show the number of 10,000's, the number of 1,000's, and the number of 100's of cubic ft. of gas which have passed through the cylinder. In the wet meter, lowering the water line, as by evaporation or tilting the meter, allows a flow of gas in excess of the amount registered. To guard against extreme loss, a float valve usually shuts off the gas supply when the water level drops to a certain point. Wet meters are also affected by cold weather. These drawbacks early led to the invention of the 'dry' meter by John Malam, 1820, which is the type largely in use at the present day.

**DRY METERS** are, in principle, a variety of piston meter; the fluid is measured by displacing a piston or diaphragm, and thereby filling a measured cavity. The dry meter casing, usually of tinned sheet iron, has one horizontal and one central vertical partition, giving three main chambers. Above the horizontal partition is the valve box and mechanism working the recording gears. On either side of the vert-

ical partition is a flexible leather diaphragm, which may be displaced over a limited range, subdividing each of these two chambers. Gas is admitted against one side of one diaphragm until the latter has moved its full extent. This movement is transmitted by a 'flag lever' and rod to a slide valve which shuts off the supply, turns it against the other side of the diaphragm, and opens the filled chamber to the house pipes. The other diaphragm operates similarly, but a quarter cycle after the first one—brought about by connecting the slide valves through reach rods to a common crank and vertical shaft, or by an equivalent mechanism, the latter working the recording gear train to show the number of diaphragm displacements (expressed directly, however, in cubic feet of gas passed). When the leather hardens and stiffens, a smaller amount of gas is passed than is recorded; if the diaphragms crack, a larger amount is passed than is recorded.

Prepayment attachments have come into use, in which a coin is inserted, and gas flows through until a certain amount has been used—that is, until a stated number of meter movements have been made—when a main supply valve closes until another coin is inserted as a temporary key between a handle and mechanism which opens a main valve and sets back the closing cam or its equivalent. In 1902 a new type of meter—the first radical departure since the days of Clegg and Malam (1820)—was invented by Thomas Thorp of Manchester, England. This type, known as the 'Rotary,' is especially intended for small sizes, but is also well adapted for station use. Other types have been invented, notably a station meter by Thomas.

**Gas or Vapor Density** is the specific gravity or relative density of a substance when in the state of gas, the standard of comparison being air or hydrogen, measured under the same conditions of temperature and pressure. Hydrogen is most commonly taken as a standard, as its use permits certain theoretical deductions to be more easily made than if the comparison is with air. The methods of determination vary in detail according to the temperature at which the substance in question becomes a gas, but are in principle the same in almost all cases, a given volume of the gas being weighed, or a given weight measured, under known conditions of temperature and pressure. Consult Ostwald's *Physico-Chemical Measurements*.

**Gasoline**, see *Petroleum*.

**Gaspé**, a peninsula in the eastern part of

Quebec province, Canada, comprising the counties of Gaspé and Bonaventure. It projects into the Gulf of St. Lawrence, between the estuary of that name on the n. and the Bay of Chaleurs on the s. It has an area of nearly 8,000 sq.m., and about 71,000 inhabitants, the greater number engaged in the fisheries, which, with the export of lumber, form the staple business of the country.

**Gaspé Basin**, a port of entry and summer resort in Gaspé Peninsula, Canada. It is the seat of extensive fisheries. Here Jacques Cartier first landed in Canada, July 24, 1534; p. 1,000.

**Gasquet, Francis Aidan** (1846-1929), abbot of the English Benedictines, occupied a distinguished place as a Roman Catholic historian, and has written: *Henry VIII, and the*

system of philosophy promulgated by Descartes, in a work entitled *Objectiones ad Meditationes Cartesii*. While at Paris he wrote his principal philosophical works, *De Vita Epicuri* (1647); a commentary on Diogenes Laertius' 10th book, *De Vita, Moribus, et Placitis Epicuri* (1649); and in the same year the *Syntagma Philosophiæ Epicuræ*, which contains a complete view of the system of Epicurus. To physical science he rendered good service by his insistence on the value of observation and experiment.

**Gastein**, an Alpine valley in the s. of Austria, with a number of small villages. The chief of these, Wildbad-Gastein, is a famous watering place with warm mineral springs, and was a favorite resort of Emperor William I. of Germany.



Types of Gastropoda.

- 1, Snail (*Helix*); 2, Slug (*Limax*); 3, Carnivorous Snail (*Arion*); 4, Edible Snail (*Helix*); 5, Marsh Snail (*Linnaea*).

*English Monasteries* (1888-9); *The Last Abbot of Glastonbury* (1895); *A Sketch of Monastic Constitutional History* (1896); *The Eve of the Reformation* (1900); *English Monastic Life* (1904); *Henry III. and the Church* (1905); *Parish Life in Mediæval England* (1906); *The Greater Abbeys of England* (1908).

**Gas Ranges and Gas Stoves** are contrivances that utilize the heat of gas for cooking and other purposes. The gas is burned with an admixture of air so as to form a hot, non-luminous flame. The burners are simple—usually in the form of pipes perforated with rows of holes, drilled evenly along the top; and the volume of air is graduated by means of adjustable shutters at the ends of the pipes.

**Gassendi** (properly **Gassend**), **Pierre** (1592-1655), French philosopher, was a philosophical critic rather than an original thinker. In 1642 he criticized adversely the new

**Gasteropoda**, or **Gastropoda** (Greek 'belly-footed'), a large class of molluscs. Among typical Gasteropods are snails, slugs, whelks, limpets, periwinkles, and the like. They are characterized by the nature of the 'foot' or muscular ventral surface. Except in certain forms adapted for free swimming, the 'foot' is simple, median, and sole-like. It is the surface on which the animals crawls. The wealth of modification included in the class is so great that no other general characters can be given.

Gasteropods are grouped first of all according to the state of the loop formed by the visceral nerves. In one series the visceral nerve loop is implicated and twisted in the torsion of the asymmetrical body, and furthermore the sexes are separate. In another series the visceral loop is not twisted, and is often very short; the shell is light, and often lost in the adult; and the animals are hermaphrodite.

The eggs of the gasteropods are usually small, and are surrounded with albumen, the surface of which becomes firm, while in the common snail and some others there is an eggshell of lime. The eggs not infrequently develop into embryos within the parent; but in most cases they are laid, either singly or in masses, and often within cocoons.

If we accept the broader classification, the number of terrestrial Gasteropods, breathing the air directly by means of a pulmonary chamber, have been estimated at more than 6,000 species; while those living in water have been estimated at more than 10,000 species, mostly marine. Deep-sea Gasteropods are comparatively few. The locomotion effected by the contractions of the muscular 'foot' is in almost all cases very leisurely, and the average tendency is toward sluggishness. In the matter of diet, the greatest variety obtains. A few are parasitic. As voracious animals, furnished with powerful rasping organs, many Gasteropods play an important part in the struggle for existence among marine organisms, while other terrestrial forms are most destructive devastators of vegetable and flowering plants. From earliest times, various Gasteropods, such as whelks, have been utilized for human consumption, and also as bait; while the shells, often so beautiful in form and color, have been used for the decoration of the person and the dwelling, for the basis of cameos, as domestic utensils, or even as weapons, and in many other ways. See *MOLLUSCA*; *LIMPETS*; *HETEROPODA*; *SNAIL*; *PERIWINKLE*.

**Gastrectomy** is an operation for the partial or complete removal of the stomach.

**Gastric Catarrh, Gastritis**, or inflammation of the stomach, may be acute or chronic, and may depend upon constitutional causes such as gout, or upon local irritation by the ingestion of unsuitable food or spirituous liquors. The condition is associated with congestion of the vessels of the mucous membrane and with increased secretion of mucus. The leading symptoms are pain and vomiting, which are exaggerated by the introduction of food.

**Gastric Colic.** Colic originally signified pain arising from intestinal spasm; but the term is no longer restricted to bowel affections, and renal, hepatic, and gastric colics are recognized.

**Gastric Fever.** See *Typhoid Fever*.

**Gastric Juice** is the secretion from the cells in the mucous membrane of the stomach, and is acid in reaction. It also contains the fer-

ment pepsin, and two other ferments—rennin, and a lactic acid ferment. It is stimulated by pleasant sensations and retarded or stopped by unpleasant sensations. The entrance of food and alkaline saliva into the stomach excites a free flow of gastric juice, although some articles of diet—notably tea, coffee, vinegar, and alcoholic beverages—check the secretion. Its chief action is upon the albuminates or proteids. These are insoluble, but are changed into soluble peptones by the ferment pepsin. Gastric juice has no digestive action upon starch, and it checks the salivary digestion. See *DIGESTION*; *DIET*; *STOMACH*.

**Gastric Ulcer.** See *Stomach, Diseases*.

**Gastritis.** See *Gastric Catarrh*.

**Gastrochæna**, a genus of boring bivalves (*Gastrochænidæ*), which also includes the remarkable *Aspergillum* and *Clavagella*. The original shell has the two valves typical of *Lamellibranchs*; but these are delicate, and become surrounded by a secondary tubular shell lining the cavity which the mollusc bores into limestone, coral, and other shells.

**Gastrocnemius Muscle.** See *Muscles*.

**Gastro-Enteritis.** See *Enteritis*.

**Gastrobium**, a genus of Western Australian evergreen shrubs, belonging to the order *Leguminosæ*.

**Gastropoda.** See *Gasteropoda*.

**Gastrostomy**, an operation performed for the relief of stricture of the gullet, to save the patient from the imminent risk of starvation by introducing food directly into the stomach through an external opening.

**Gastrotomy**, an incision into the cavity of the stomach, generally for the purpose of removing some diseased tissue or foreign body. It is also performed as an exploratory operation to ascertain exactly the nature or extent of disease.

**Gastrula, Gastræa**, the name applied by Haeckel to a thimble-shaped larva which appears in the life history of many different kinds of organisms. Such a larva, as it occurs in an annelid, or in the simple vertebrate amphioxus, consists of an outer layer of cells, or ectoderm, and an inner or endoderm. The inner layer lines the gastral cavity, which communicates with the exterior by an opening called the blastopore. The gastrula itself arises from a blastosphere, or hollow ball of cells, by the folding in of the cells at one point. The outer and the inner layer of cells of the gastrula always give rise to definite organs of the future animal. See *EMBRYOLOGY*.

**Gas Turbine**, a turbine engine operating by the energy of exploded gases. The most

successful of recent gas turbines is the Holzwarth, an explosion turbine invented in Germany. The combustion chamber is intermittently filled with a mixture of gas and air. Then follow ignition, explosion, and increase in pressure of the burnt gases and their expansion through a nozzle, after which they act on a horizontal turbine wheel. The explosion chamber is next effectively scavenged and cooled by fresh air. Five or ten similar explosion chambers are arranged in a circle at the base of the turbine, and act one after the other, or in series. After the combustion chamber has been filled with compressed air, compressed gas is driven in. While this is taking place the nozzle valve remains closed; but immediately upon ignition it is forced open by the pressure of the explosion, and the available energy (pressure) in the gases is transformed into kinetic energy (motion) by permitting expansion at the nozzle. The base of the machine contains all the mechanism for the inlet of the gases and for their ignition. The fuels used successfully in the Holzwarth turbine include illuminating gas and producer gas, benzine, gas oil, and benzol.

**Gatchina, or Gatschina**, town, Russia; has manufactures of porcelain, and several barracks, but is especially worthy of mention for its royal palace; p. 16,600.

**Gate**, a portal or entrance into a walled enclosure, or into a structure of notable purpose or use, as the gate of a city, the gate of a fortress.

**Gates, Frederick Taylor** (1853-1929), American financier, was born in Maine, N. Y. He was pastor of the Central Church, Minneapolis, from 1880 to 1888. Subsequently, 1888-93, he was corresponding secretary of the American Baptist Educational Society; and in 1893 he was appointed representative of John D. Rockefeller in connection with several industrial, educational, and charitable organizations. He was chairman of the General Education Board, and also of the Rockefeller Institute for Medical Research.

**Gates, Horatio** (1728-1806), American soldier, was born in Maldon, Essex, England. He early entered the British army, and in 1755 was sent to America, to serve against the French in the French and Indian War. As captain, he accompanied Braddock's expedition against Fort Duquesne. In the War of Independence he sided with his adopted country, receiving in 1776 command of the army which had just retreated from Canada. For a short time he served under Washington in New Jersey; and in August, 1777, superseded

Schuyler in command of the Northern Department. His campaign against Burgoyne ended in the surrender of the British general and his army at Saratoga. Gates became jealous of Washington, and was probably cognizant of the Conway Cabal, whose object was to bring about Washington's retirement and the appointment of Gates to the chief command of the Continental army; in Nov., 1777 he was made president of the Board of War. In June, 1780, Gates was placed in command of the Southern Department, but in this position his incapacity soon became apparent, and after being defeated by Cornwallis at Camden, Aug. 16, 1780, he was superseded by Gen. Greene.

**Gates, Merrill Edwards** (1848-1922), American educator and authority on Indian affairs, was born at Warsaw, N. Y. After 12 years as principal of the Albany Boys' Academy, he went to Rutgers College as president in 1882. From 1890 to 1899 he was president of Amherst College. For 10 years from 1889 he was chairman of the U. S. Board of Indian Commissioners, and for 8 years president of the Lake Mohonk Indian Conference.

**Gates, Seth Merrill** (1800-77), American public man, born in Herkimer co., N. Y. On his election to the state legislature in 1832, he procured a charter for the first railroad in western New York, which subsequently became a part of the N. Y. Central R. R. system. In 1838 he became editor and proprietor of the *Le Roy Gazette*. He was author of the famous protest by the Whigs in Congress against the annexation of Texas, in 1843.

**Gates, Sir Thomas** (?-c. 1621), first colonial governor of Virginia, was born in Devonshire, England. He was with Sir Francis Drake on his voyage to America in 1585-6, and subsequently took service for the Netherlands. He was one of the procurers of the colonizing charter of Virginia, 1606. In 1609 he was chosen deputy governor, and that year sailed for Virginia. In 1614 he returned to England again, occupying himself there with colonizing affairs, and in 1620 he was appointed one of the council for the government of New England.

**Gateshead**, parl., munic., and co. bor. in Durham, England, on the s. side of the Tyne, opposite Newcastle. The church of St. Mary is a handsome cruciform structure assigned to the 12th century, but it has been almost entirely rebuilt, the earlier edifice having been burned in 1854. Trinity Chapel, formerly St. Edmund's, is believed to occupy the site of an ancient monastery. The hydraulic swing

bridge, opened in 1876, occupies the site of a Roman bridge. The manufacture of locomotives, anchors, chain cables, etc., is largely carried on. Excellent grindstone is quarried, and coal is mined. Area, 3,132 ac.; p. 124,514.

**Gath**, one of the five royal cities of the Philistines, on the border of Judah; was the birthplace of Goliath.

**Gatling, Richard Jordan** (1818-1903), American inventor of the machine gun known by his name, born in Hertford co., N. C. He invented several machines for sowing seeds, and also a steamplough, before turning his attention to firearms.

**Gatschet, Albert Samuel** (1832-1907), Amer. ethnologist and linguist, b. near Berne, Switzerland. In 1868 he settled in New York, and while connected with several German publications, took up the study of the dialects of the American Indians, particularly of the Tonkawa, Yuma, Creek, and Timucua tribes. In 1877 he was appointed ethnologist of the U. S. Geological Survey, and two years later the linguist of the Bureau of American Ethnology. Among his publications are *Indian Languages of the Pacific States and Territories of the Pueblos of New Mexico* (1882); *The Klamath Indians of Southwestern Oregon* (1890).

**Gatchina**. See **Gatchina**.

**Gatti-Casazza, Giulio** (1869-1940), an operatic manager, born in Udine, Italy; was director of La Scala in Milan before becoming manager of the Metropolitan Opera House, New York, in 1908. From the beginning of his administration Gatti-Casazza followed the policy of encouraging native singers and of producing new operas by American composers. No American work found its way into the Metropolitan before his régime. In 1935 Gatti-Casazza resigned as manager of the Metropolitan Opera Company at the end of 27 years as its guiding spirit.

**Gatun**. See **Panama Canal**.

**Gau**. See **Ga**.

**Gauchos**, the Hispano-American inhabitants of the pampas of Argentina. They have but a slight strain of Indian blood. They are the 'centaurs' of the pampas, often sleeping for hours in the saddle. Their skill in the use of the lasso is extraordinary, and has been acquired in tending the half-wild herds.

**Gaugamela**, vil. of Assyria, a few miles e. of Nineveh, near which, in 331 B.C., Alexander the Great routed the Persian host under Darius.

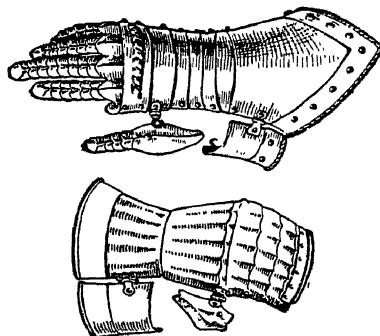
**Gauge**, the width of a railway track measured from inside to inside of the heads of the

rails. The standard gauge of any country is that adopted by the majority of its railways.

**Gault**, a stiff bluish or grayish clay which lies between the Lower and Upper Greensand divisions of the Cretaceous system. The Gault is best developed in the e. and s.e. of England where it mostly forms a low valley at the base of the escarpment of the White Chalk.

**Gaultheria**, a genus of American shrubs belonging to the order of Ericaceæ.

**Gauntlet**, the protective armor of the hand. The first gauntlets were evolved from the chain-mail bag which, in the 12th century, terminated the sleeves of the hauberk.



Gauntlet and 'Mitten'.

**Gaur** (*Bos gaurus*), a wild ox erroneously called by sportsmen 'Indian bison,' distributed throughout the forest regions of India and Burma.

**Gaura**, a genus of hardy annual and perennial herbaceous N. American plants belonging to the order Onagraceæ.

**Gauss, Christian** (1878- ), college dean, born at Ann Arbor, Mich., was an instructor in romance languages in the University of Michigan (1899-1901). He joined the faculty of Princeton University in 1907, becoming dean of Princeton College in 1913. His books include: *The German Emperor* (1915); *Through College on Nothing a Year* (1915); *Why We Went to War* (1918); *Life in College* (1930).

**Gauss, Karl Friedrich** (1777-1855), German mathematician, born at Brunswick. From 1807 until his death he held the directorship of the Göttingen observatory. In 1833 Gauss erected, in conjunction with Weber, a magnetic observatory at Göttingen. He conducted the trigonometrical survey of the kingdom of Hanover.

**Gautier, Théophile** (1811-72), poet, and one of the most influential French prose writers of the middle of the 19th century, was

born at Tarbes. Gautier made his début with a volume of verse in 1830. His prose work, *Mademoiselle de Maupin*, published in 1835, caused no small scandal at the time, because of its appeal to the lubricity of its readers. In 1838 Gautier wrote his *Comédie de la Mort*, which marks a break with his first romantic epoch. Soon after this he began his series of travel-pictures, which extend from 1845 to 1866, and describe various parts of France, Italy, Spain, Russia, and Turkey. During the same period Gautier was writing a series of archæological works, of which *Le Roman de la Momie* is the best known. *Le Capitaine Fracasse*, 1863, is a sort of aftermath of the romantic spirit, tending more toward irony and towards the fantastic than the earlier books. Gautier died at Neuilly, near Paris. The following is a partial list of his principal productions: Poems—*Les Intérieurs et les Paysages* (1845); *Emaux et Camées* (1852). Novels, stories, etc.—*Une nuit de Cléopâtre* (1836); *Militona* (1848); *Les Roués Innocents* (1849); *Jean et Jeannette* (1850); *Jettatura* (1857); *Le Peau de Tigre* (1852); *Les Jeunes France* (1867). To these must be added the half-autobiographical *Paradis des Chats* and *Ménagerie Intime* (1869). Finally, an immense quantity of criticism of literature and art, and of the history and art: *L'Art Moderne* (1852); *Les Beaux-Arts en Europe* (1852); *Histoire de l'Art Dramatique* (1860); *Histoire du Romantisme*, published in his collected *Œuvres*. Biographical sketches—*Honoré de Balzac* (1859); etc. There is an English translation of *The Works of Théophile Gautier*, by Sumichrast.

**Gauze**, a light transparent fabric of silk, woven with fine yarn, deriving its name from Gaza, in Palestine, where it is said to have been first manufactured.

**Gavarni, Paul**, *nom de guerre* of **Sul-pice Guillaume Chevalier** (1801-66), French caricaturist, born in Paris. His clever sketches of Parisian life and manners led to his appointment as caricaturist of *Le Charivari*. His *Œuvres Choiesies* appeared at Paris, 1845-8, and *Perles et Parures*, 1850. Among other works, Gavarni illustrated those of Balzac, and the *Wandering Jew* of Eugène Sue. See *Life*, in French, by E. and J. de Goncourt (1879).

**Gavelkind**. In England, an ancient form of tenure of land, which obtained long before the Norman Conquest. Under it, the lands descend in cases of intestacy to all the sons equally; the estate did not escheat in cases of attainder for felony, and the tenant could con-

vey it by feoffment at the early age of 15. This tenure has been abolished as to most of the land formerly so held, but it still prevails in a few places in Kent. See **FEUDALISM**; **TENURE**.

**Gavial**, or **Gharial**, one of the crocodilians, differing from the common crocodile in the slender and elongated snout. It reaches a length of twenty feet or more.

**Gavotte**, a dance somewhat resembling the minuet, which flourished most in the 17th and 18th centuries.

**Gawain**, hero of the Arthurian cycle, was the son of Arthur's sister and Lot, afterward king of Norway and the Orkneys. He performed gallant deeds in the war with Rome, and died in battle against his brother Mordred. In the hands of the French romancers Gawain became the model of all knightly virtues, and as such he is the hero of the majority of the shorter 'episodic' romances. The fine poem *Syr Gawayne and the Grene Knyghte*, and the quaint story of the *Wed-dynge of Syr Gawayne*, both find their earliest and best parallel in Irish tradition. The most famous series of adventures connected with Sir Gawain, in French romance, are those related in Chrétien de Troyes's *Perceval*. See *The Legend of Sir Gawain*, by J. L. Weston, Grimm Library, vol. vii. (1897).

**Gay, Edward** (1837-1928), American artist, born Dublin, Ireland, and was brought to America in 1848. His painting, *Broad Acres*, received the Metropolitan prize of \$2,000 in 1887, and is placed in the Metropolitan Museum in New York.

**Gay, Edwin Francis** (1867- ), professor, was born in Detroit, Mich. Instructor in economic history in Harvard University, 1902-3; asst. professor, 1903-6; professor since 1906; dean of the Graduate School of Business Administration, 1908-19. He was president of the New York *Evening Post*, 1919-24.

**Gay, John** (1685-1732), English poet and dramatist, was born at Barnstaple in Devonshire. His greatest success was the *Beggar's Opera* (1728), which for a season drove the Italian opera out of England. A sequel, called *Polly*, was refused a license by the lord chamberlain, but was published in 1729. He was buried in Westminster Abbey. Perhaps he is best known now by his *Fables* and such ballads as *Black-eyed Susan* and *'Twas when the Seas were Roaring*. Collected works are *Plays* (1760); *Works* (4 vols. 1770); *Poems never before printed* (1820); *Fables*, ed. by Austin Dobson (1882); *Poems*, ed. by J. Underhill (2 vols. 1893).



**Gay, Sydney Howard** (1814-88), American journalist and historian. He was born in Hingham, Mass. In 1842 he became a lecturer for the National Anti-Slavery Society, and in 1844 the editor of the *Anti-Slavery Standard*. From 1862 to 1866 he was managing editor of the *New York Tribune*. He joined the staff of the *Chicago Tribune* in 1868, and in 1872 became an editorial writer upon the *N. Y. Evening Post*. The *Popular History of the United States*, by William Cullen Bryant and Sydney Howard Gay, owed its accuracy and graphic qualities chiefly to him.

**Gay, Walter** (1856-1937), American painter, born Hingham, Mass. His *Bénédictine* was bought by the French government and given to the Amiens museum, and *Las Cigarreras* is in the Paris Luxembourg gallery. His *Spinners*, which won honorable mention at the Salon of 1885, is in the N. Y. Metropolitan Museum. The Tate Collection in London and the Boston Museum of Fine Arts also have some of his important pictures.

**Gaya**, chief tn., Gaya dist., Bengal, India. Six m. to the s. is Buddha Gaya, the site of a temple dating from B.C. 543. Gaya is annually visited by many pilgrims; p. 71, 288.

**Gayal** (*Bos frontalis*), or **Mithan**, a semi-domesticated, also wild, ox in the hilly districts of N.E. India.

**Gay Head**, town, Dukes co., Massachusetts, at the w. end of Martha's Vineyard. A lighthouse is situated on the cliffs nearby. There is an Indian reservation here; p. 200.

**Gay-Lussac, Joseph Louis** (1778-1850), French chemist and physicist, was born in St. Léonard, Haute-Vienne. He carried on researches into the composition of the atmosphere in conjunction with Biot. These resulted in Gay-Lussac's important discovery that the proportions by volume in which gases combine are simply related, both to each other and to the volume of the product. Other important researches were connected with the composition of water, the expansion of gases and of fluids, and the process of evaporation. With Thénard he discovered a process for producing potassium by chemical action. In 1813-14 he published valuable memoirs on iodine; and in 1815 he isolated the compound radicle cyanogen. Among his numerous scientific works were *Mémoires sur l'Analyse de l'Air Atmosphérique* (with von Humboldt, 1804); *Recherches Physico-Chimiques faites sur la Pile* (with Thénard, 1811); *Cours de Physique* (1827).

**Gaylussacia**, a genus of American shrubs

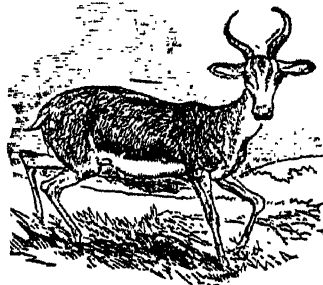
of the order Ericaceæ, and including some of the huckleberries.

**Gaynor, William Jay** (1851-1913), American jurist and public official, was born in Oneida co., New York. While studying law in New York he worked on the newspapers of that city and of Brooklyn, and began practice in 1875. He acquired wide publicity by his opposition to 'rings' in the local Democratic Party. After repeatedly declining to be a candidate for mayor and for governor, Judge Gaynor was in 1909 elected mayor of New York City. In August, 1913, he was renominated for mayor as an independent candidate, but he died on shipboard on Sept. 11, 1913, while on his way to Europe. Gaynor was well known not only as a courageous advocate of popular government, but as a student of human nature and a philosopher.

**Gaza**, city, Palestine, near the Mediterranean. It is the commercial center of the district; exports wheat, barley, sesame, and wool; p. 40,000. Gaza was one of the 5 chief cities of the ancient Philistines. In 333 B.C. it was taken by Alexander the Great, and from that time to 1799, when the French captured it, it witnessed the victories of the Maccabees, the Calif Abu-bekr, the Templars, and Saladin.

**Gazaland**, territory in Portuguese East Africa, watered by the Sabi and Limpopo.

**Gazelle**, a genus of small antelopes, including some of the most beautiful of these animals, characterized by their lyrate horns. The majority inhabit the sandy deserts of



*Dorcas Gazelle.*

North Africa, and all are of a yellowish color, with characteristic face marking. This consists of a dark triangle on the forehead, defined by two white streaks, which extend from the base of the horns to the nose, and are bordered externally by dark stripes.

**Gazetteer**, geographical dictionary, more or less descriptive and statistical. The first known book of this kind is the work of Stephen of Byzantium, in the 6th century. Some of the best known gazetteers in English are: Blackie's *Imperial Gazetteer* (Glasgow, 1850); Johnston's *Dictionary of Geography* (1850); Longman's *Gazetteer of the World* (London, 1895); Lippincott's *Gazetteer* (Philadelphia, 1855). Among special gazetteers may be enumerated those of Bartholomew, Cassel, and Mackenzie, for Great Britain; Hunter's *Imperial Gazetteer of India* (1886-8; new ed. 1910); Neumann's *Ortsund Verkehrslexikon*, for Germany; the great work of Semenoff (1863-85), for Russia; and the government series of departmental gazetteers for France. Gazetteers of the various States, and also of the Philippine Islands, are published in the United States.

**Geant, Col du**, glacier pass (11,600 ft.) in the Alps, leading from Chamonix in France to Courmayeur in Italy.

**Gearing** is generally understood to refer to wheel or toothed gearing and friction gearing, with their necessary adjuncts of shafting, bearings, etc. For a description of BELT AND ROPE TRANSMISSION, and of the gearing of MOTOR CARS and CYCLES, see the articles under those headings.

**Geary, John White** (1819-73), American soldier and politician, was born in Westmoreland co., Pa., of Scotch-Irish descent. When serving as assistant-engineer of the Allegheny and Portage railroad he was appointed lieutenant-colonel of the 2d Pennsylvania regiment in 1846, and served throughout the Mexican War. In 1849 he was appointed postmaster of San Francisco, and in 1850 became the first mayor of the city. In 1856 President Pierce appointed him governor of the territory of Kansas, at that time the scene of the fierce struggle between slavery and free-soil settlers. For his military achievements in the campaigns of the Army of the Potomac, he was, in 1862, promoted to be brigadier-general. He acquired further reputation in the engagements at Bolivar Heights, at Leesburg, and at Cedar Mountain. In the battles of Chancellorsville and Gettysburg he commanded the second division of the 12th Army Corps. In the Army of the Cumberland, in 1863, he helped save the day at Chickamauga, and took a prominent part at Lookout Mountain. He was the first to enter Savannah with Sherman's army, and was made military commander of that city. In 1866 he was elect-

ed governor of Pennsylvania, and held the office almost till the day of his death.

**Geber**, or **Gebir**, the reputed author of a great number of works in Arabic and in Latin, dealing with chemistry, alchemy, and allied subjects. Arabic authorities generally identify him with Jabir ibn Hayyan, who lived about the end of the 9th and the beginning of the 10th century at Cufa. Other authorities deny the existence of any real person of the name of Geber. The presumption is, therefore, that they were written by unknown authors, and by them attributed to Geber, in order to ensure for them a readier and wider circulation. Consult also R. R. Steele's *Discovery of Secrets attributed to Geber* (Eng. and Arabic), 1892.

**Gecko**, a small four-footed lizard of the family Geckonidæ, widely distributed throughout the world, especially in warm countries. The geckos are insect-eaters, and are harmless to man.

**Geddes, Andrew** (1783-1844), Scotch etcher and painter, was born in Edinburgh. He was chiefly successful as a portrait painter, his *Portrait of the Artist's Mother* being one of his finest works.

**Geddes, Sir Auckland Campbell** (1879), British physician and public official; professor of anatomy in the Royal College of Surgeons in Dublin, and in McGill University, Montreal. He was appointed Director of Civil Recruiting in 1917, was Minister of National Service, 1917-19, and was made Minister of Reconstruction in 1919. He was British Ambassador to the United States, 1920-1924.

**Geddes, James** (1763-1838), American engineer and politician, was born near Carlisle, Pa. He was an early advocate of the Erie Canal, made the preliminary surveys in 1808, and in 1816 became its supervising engineer. He was also chief engineer of the Champlain Canal, made surveys for the Lake Erie and Ohio Canal in 1822, located the Chesapeake and Ohio Canal in 1827, and was engineer of the Pennsylvania canals in 1838.

**Geddes, Jenny**, according to tradition, a 'kail-wife' or vegetable-seller in the High Street of Edinburgh, who, on the Sunday, July 23, 1637, when Archbishop Laud's service book was used for the first time in St. Giles' Church, flung a stool at the head of David Lindsay, bishop of Edinburgh, and caused a riot.

**Gedney Channel**, passage across the sandbar off Sandy Hook, in Lower New York

Bay, known as the 'ship channel.' It is navigable to large vessels at low tide.

**Geefs, Willem** (1806-83), Belgian sculptor, was born in Antwerp. He was awarded the *Grand Prix* in 1828 for a statue of Achilles. His most striking work is the *Mausoleum of the Count of Mérode*, in St. Gudule, Brussels. Other works include busts of King Leopold and the Prince Consort, statues of General Belliard, Charlemagne, Rubens, and Francesca da Rimini.

**Geelong**, town, Grant co., Victoria, Australia, is situated on Corio Bay, the western branch of Port Philip; has excellent harbor facilities and has developed a considerable woolen trade. Fishing is also carried on; p. 43,150.

**Geelvink Bay**, a large bay on the north coast of Dutch New Guinea.

**Geestemünde**, seaport, Prussian province of Hanover, on the Weser. It has excellent harbor facilities and is the chief station of the German deep-sea fishing fleet; p. 25,061.

**Gehenna**, the Greek form of the Hebrew *Gehinnom*, Valley of Hinnom. In this narrow gorge, s. and w. of Jerusalem, Solomon built a high place for Moloch, and Gehenna seems to have become a favorite spot with the later Jewish kings for the celebration of idolatrous rites.

**Gehrig, Lou** (1904-1941), 'iron man' of baseball. From June, 1925, to May, 1939, he played 2130 consecutive games at first base for the New York, A. L., team, far surpassing all previous consecutive-service records. He compiled a lifetime, big league batting average of .341; drove in 1,991 runs, made 2,721 hits, 1,192 for extra bases; made 1,886 runs; and 494 home runs. In June, 1939, was discovered to have a rare form of infantile paralysis but he remained with his team through the 1939 season without playing again. Was appointed a New York City parole commissioner in Oct. 1939.

**Geikie, Sir Archibald** (1835-1924), Scottish geologist, born in Edinburgh. In 1867 he became director of the Geological Survey for Scotland, and in 1881 was appointed director-general of the Geological Survey of the United Kingdom and director of the London Museum of Practical Geology. Among his publications are: *Field Geology* (5th ed. 1900); *The Ancient Volcanoes of Great Britain* (1897); *Landscape in History* (1905); also *Charles Darwin as Geologist* (1909), and the autobiographical *Scottish Reminiscences* (1904).

**Geisha**, the name applied to the profes-

sional dancing and singing girls of Japan, and sometimes to those of loose morality. The true geisha begins her training at seven years of age, and when sufficiently accomplished enters into a contract with her employer for a number of years.

**Geissler, Heinrich** (1814-79), German inventor and physicist, was born in Saxe-Meiningen; gained a wide reputation as the inventor of various physical and chemical apparatus. Among his inventions are a vaporimeter, mercury air pump, and aerometer; but his name is chiefly associated with the Geissler tube, in which the interrupted electric current is made to pass through rarefied gases.

**Gela**, Greek colony on the s. coast of Sicily, founded by Rhodians and Cretans in 688 B.C. Æschylus died here in 456 B.C., and here Apollodorus was born.

**Gelada**, a baboon found in Abyssinia, with shaggy brown mane and tufted tail.

**Gelasius**, the name of two Popes. (1.) **GELASIUS I.** (d. 496), of African descent, became Pope in 492. Canonized on his death, Nov. 18 was assigned to St. Gelasius in the calendar. (2.) **GELASIUS II.** became Pope on the death of Paschal II. in 1118, but was driven into France by the Emperor Henry V., and died in the monastery of Cluny, near Macon, in the following year.

**Gelatin** is the nitrogenous product obtained by the action of boiling water on the collagen of skins or the ossein of bones, and differs from glue and size only in the care with which it is made. Gelatin consists approximately of carbon 49.6, oxygen 25.4, nitrogen 18.3, and sulphur about 0.1 per cent. It is soluble in hot water, in acetic acid, and in cold sulphuric acid, and is insoluble in alcohol, ether, and other organic liquids.

Of late years the commercial uses of gelatin have greatly increased. It is the foundation of the dry-plate system of photography. It is further extensively used by druggists for coating pills and nauseous drugs; and by confectioners for some kinds of sweetmeats. See **PHOTOGRAPHY; PROCESS WORK.**

One of the qualities of gelatin is its power to form chemical combinations with certain organic matters; hence when it is mixed and dissolved in a fluid containing such matters. It combines, and the compound is precipitated, carrying down with it all floating substances that by their presence render the liquid cloudy; hence its great value in clarifying beer and other liquids. For this reason *isinglass*, which has been found the best

gelatin for the purpose, is very largely consumed by brewers. See GLUE; ISINGLASS.

**Gelderland**, or **Guelderland**, province of the Netherlands, s.e. of the Zuider Zee. The soil in the Betuwe district, in the s., is of exceptional fertility. There are various industries, among which are paper, bricks, cotton, spirits, sugar. Area, 1,964 sq. m.; p. 726,390.

**Gelée**, **Claude**. See **Claude Lorraine**.

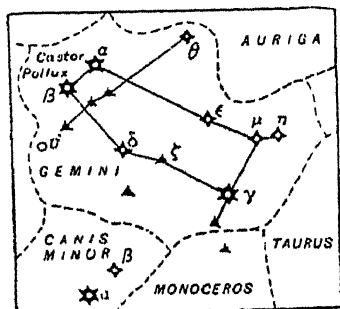
**Gellert**, **Christian Furchtegott** (1715-69), German writer, was born at Hainichen in Saxony. His *Fabeln und Erzählungen*, 1746 and 1748, was more widely read than any other book in the 18th century.

**Gellivara**, a great iron-mining town and mountain of Norrbotten, Sweden; p. 16,233.

**Gelon** (d. 478 B.C.), tyrant of Gela and afterward of Syracuse, contrived to become successor to Hippocrates, its tyrant, in 491 B.C. Six years later he made himself master of Syracuse also, which then became the seat of his government, and to which he transferred the majority of the inhabitants of Gela. His influence soon extended itself over the half of Sicily. He defeated the Carthaginians in a great victory at Himera.

**Gelsemium Sempervirens**, the yellow or Caroline jasmine (natural order Loganiaceæ), is a climbing plant of the Southern United States, having large, axillary, fragrant, clustered blossoms, and perennial dark-green leaves. The root is the source of the poisonous alkaloid *Gelsemine*.

**Gemara**, that portion of the Talmud which contains the annotations and commentaries of the Mishna. See MISHNA; TALMUD.

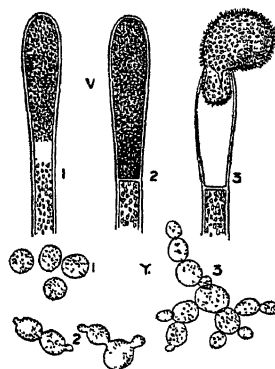


*The Constellation Gemini.*

**Gemini**, a zodiacal constellation, and the third sign of the zodiac, entered by the sun about May 20, and marked by the symbol ♊. The bright stars Castor and Pollux indicated respectively, in classical times, the heads

of the two constellation figures. The Milky Way traverses the feet of the twins.

**Gemmation**, a process occasionally observed in plants, chiefly in those with simple organization. It consists in the protoplasmic contents of a cell pushing out the cell wall at a given point so as to form a bud or warty prominence. This increases in size, and becomes cut off from the parent cell by a dividing cell wall. See REPRODUCTION.



*Gemmation.*

v, Vaucheria; γ, yeast; 1, 2, 3, successive stages of growth.

**Gemmi Pass**, an Alpine pass (7,641 ft.), connecting Kandersteg in the Bernese Oberland with Leukerbad in Valais.

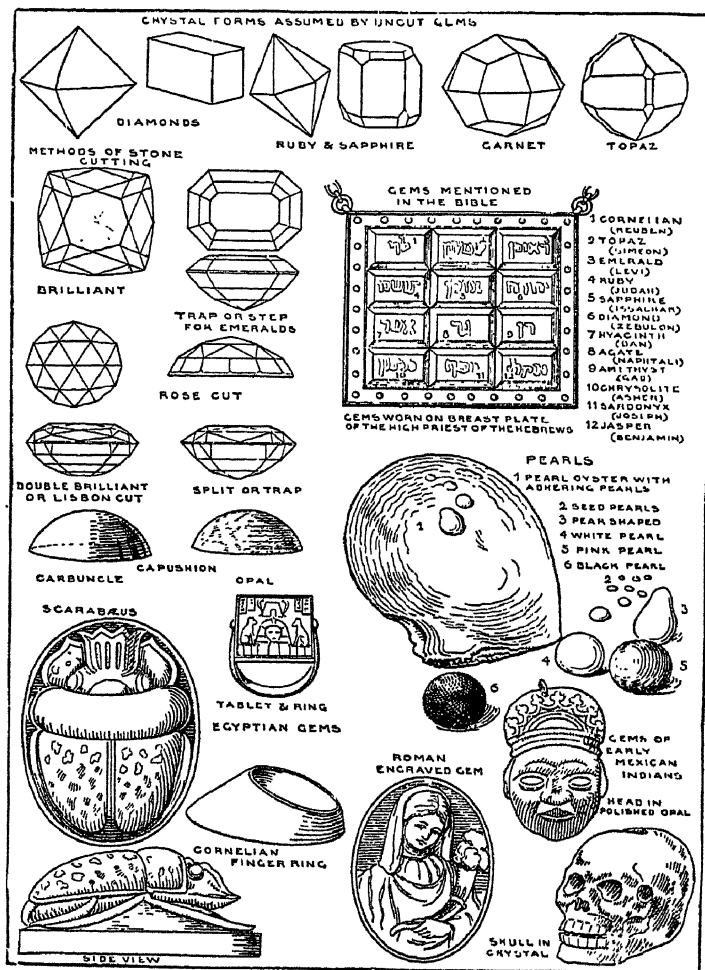
**Gems and Precious Stones**. It is customary to class as gems precious stones and those shells and similar materials which have been enriched with engraved designs cut into or upon their surfaces. When these designs are engraved beneath the surrounding surface they are termed intaglios; if the subject carved is in relief and above the surface of the ground, the gems are then known as cameos.

The earliest records of gems are those of the Babylonian, Assyrian, and Egyptian races, each of whom possessed cylindrical stones engraved in intaglio, and mounted into ring shapes of gold, centuries before the Christian era. Oval-shaped gems of a beetle-like form, and hence called scarabs, were common among the Egyptians, the scarab being regarded as the emblem of eternity.

Greek gems are generally of most exquisite finish, in both subject and treatment, and are chiefly in intaglio. The Romans used shells and stones also in which layers of different colors occur, as in onyx, so that very beautiful effects were obtained by carving the cameo

in one or more colored layers upon a ground of another color. In early Christian worship, vessels and objects of gold and silver were enriched with gems and precious stones. But it was not until the Italian Renaissance that the art of gem engraving revived. In the 18th and 19th centuries, in England, shell cameos for brooches, and engraved seals worn

angles to the upper surface. The circumference of the stone is called the girdle, and by this it is afterward secured by small claws or projections of gold when set by the jeweller. Below this girdle the stone is again faceted in a pyramidal form; on an ordinary 'brilliant' cut stone there are in all fifty-eight planes or facets. Other transparent stones are



*Gems and Precious Stones.*

in bunches at the end of the watch chain or ribbon, were much in vogue.

The Cutting and Polishing of precious stones is a very delicate and difficult operation, requiring much skill on the part of the worker. Diamonds are generally cut with a flat surface or table, surrounded by smaller planes called facets, which are inclined at

cut in a similar manner. Emeralds are often cut with a rather large flat top with a series of sloping bevelled facets, and are then termed 'trap' or 'step' cut. The object of cutting transparent stones is, of course, to secure the brilliancy and play of reflected and refracted light from and through the polished facets. Opals, turquoises, moonstones, cat's-eyes, and

opaque stones are cut *en cabochon*—rounded on their upper surfaces, and flat or rounded on their under sides. Apart from their color and their usually high indices of refraction, the most notable characteristic of precious stones is their hardness. While this accounts for the difficulties met with in cutting them, it also leads to the preservation of the cut surfaces. It may here be remarked that it is the high specific gravity of the diamond which affords a ready means of identifying it.

The chief precious-stone deposits of the United States are situated as follows: sapphires, Montana; opals, California and Nevada; agate, chalcedony, tourmaline, spodumene, kunzite, California; turquoise, California, Arizona, New Mexico, Texas, and Nevada; tourmaline also in Maine. There are interesting possibilities of finding diamonds in Arkansas, as several hundred have already been washed out; and of finding emeralds in North Carolina.

Consult King's *Handbook of Engraved Gems*; Jones' *History and Mystery of Precious Stones*; Kunz's *Gems and Precious Stones of North America*; Streeter's *Precious Stones and Gems*; Wodiska's *Book of Precious Stones* (1910).

**Gems, Artificial.** The manufacture of precious stones is now of considerable importance, and some of the products of the laboratory are almost indistinguishable by the non-expert from natural gems. It is necessary to distinguish several varieties of artificial stones. A synthetic stone is of identical chemical composition with the natural stone; a reconstructed stone is made of pieces of the natural stones fused together; in an imitation stone the appearance is simulated by compositions differing from the natural gems.

Attempts to manufacture diamonds by the synthetic method have so far been commercially valueless, though a fortune awaits the successful experimenter. As every one knows, the diamond is chemically an allotropic form of carbon, and Moissan and others have produced artificial diamonds by dissolving carbon in molten iron. This is cast in a mould, and when the exterior has solidified the mass is suddenly cooled by a stream of water. The outer part contracts, and greatly compresses the interior, and part of the carbon separates out and crystallizes as small diamonds. However, it does not appear that any crystals have so far been manufactured as large as one millimetre in diameter.

It is in the manufacture of the 'synthetic ruby' that the artificial gem maker has

reached the highest point of perfection. The ruby is nothing more than crystallized alumina, or oxide of aluminum, and about 2 per cent. of oxide of chromium. This oxide, in the form of a fine white powder, can be readily purchased at a cheap rate, or made in the acetylene flame by the decomposition of ammonium-aluminum alum. Sapphire is of the same material, the only difference between ruby and sapphire being in the color. The fine red color of the ruby is due to traces of oxide of chromium; the deep rich blue of the sapphire may be due either to a lower oxide of chromium, or to an oxide of titanium. The oxide of cobalt, often proposed for this use, produces only a transparent glass with the alumina, while the product must be crystallized to produce either the ruby or the sapphire.

These synthetic stones, when properly made, have some advantages over the natural rubies, owing to their uniformity. There is one in the dividing engine at Johns Hopkins University,  $\frac{1}{4}$  inch in diameter by  $\frac{3}{16}$  inch long, whose end does not depart from a plane by over  $\frac{1}{100,000}$  inch. A natural ruby of this size, uniform in texture, would have been prohibitive in price.

The sapphire, Oriental emerald, Oriental topaz, spinel, and chrysoberyl are prepared in essentially the same manner, but with the addition of appropriate coloring material.

Synthetic stones may be distinguished from natural ones in a variety of ways. For example, in the synthetic stone there will usually be a few gas bubbles of microscopic dimensions. In the synthetic stones these will be bounded by curved surfaces approximately spherical; in the natural stones they will be flat or irregularly shaped. However, the best of the synthetic stones will show no bubbles whatever; so that from the mechanical standpoint they are more nearly perfect than the natural. Their very lack of flaws, however, militates against them, as much of the fire of the natural stones is due to flaws. The most valuable criterion is the history of the stone. If it is known to have been in existence for more than twenty years, its authenticity may be taken for granted.

Imitations of precious stones usually consist of a soft, heavy-flint glass called strass or paste, appropriately colored; they may be readily distinguished, among other peculiarities, by their great softness. Fraudulent combinations are made by cementing thin plates of precious materials over, and sometimes also under, a body of valueless glass;

and thus the exposed surface or surfaces, when tested, are real stones, and the veneered mass passes as a large and valuable gem.

**Gemsbok**, a species of South African antelope. It is a heavy, stout animal, about the size of a stag, with rough reversed hair on the neck and along the ridge of the back; large pointed ears; and almost perfectly straight horns in the plane of the forehead, little diverging, and ringed for about half their length. The gemsbok is becoming almost extinct.

**Gemünder, George** (1816-99), German-American violin maker, was born in Ingelfingen, Würtemberg. He moved to the United States in 1847, settling first in Boston, and then in New York, 1852. The best of his instruments are considered the finest yet produced in America. He wrote *George Gemünder's Progress in Violin Making*.

**Gendarmes** were originally mounted lancers, armed at all points, and attended by five inferior soldiers, who were furnished by the holders of fiefs. In France, since the Revolution, except for a short interval at the Restoration, the gendarmes have constituted a military police, which comprises both cavalry and infantry. They are chosen largely from the army, to which they continue to belong, and they are liable at any time to be employed in active military duties.

**Gender**, a grammatical distinction between words corresponding directly or metaphorically to the natural distinction of sex. Names applied to the male sex are said to be of the masculine gender; those applied to the female sex, feminine; while words that are neither masculine nor feminine are said to be neuter or of neither gender. In modern English we have no such thing as merely grammatical gender, save when sex is implied metaphorically to inanimate things by such a figure of speech as personification; but in Old English, as well as in Sanskrit, Greek, and Latin, the greater part of inanimate things are either masculine or feminine, the others being neuter.

**Genealogy**, an account or tabulated statement of the ancestors or descendants of a particular person or family. The nations of the East, notably Arabs and Jews, carefully traced and preserved their genealogies; and the same trait appears in the Celtic races of Western Europe. The feudal system and the growth of heraldry fostered genealogical study, but the early efforts in this direction were fantastic to a degree. Critical gene-

alogical research may be said to be nonexistent in England until the 16th century, when at stated intervals the College of Heralds began to make visitations of the various counties. These visitations continued until about 1680, when the need for them ceased with the improved character of parish records, the recording of pedigrees at the Heralds' College, and the growth of a reliable literature upon the subject.

**United States**.—Owing to diversity of race and customs among the early settlers, each original colony of the United States may be regarded as a separate field for study. In all the States, to a varying degree, State and colonial archives, military and civil lists, marriage licenses, and church, probate, land, tombstone, and Bible records exist, with newspaper marriages and deaths, and in most of the original States the government and local societies are rapidly printing these statistics. The *American Historical Association*, under the auspices of the Smithsonian Institution, has issued a number of volumes dealing with the extent and condition of public archives.

**General**, in the Roman Catholic Church, the supreme head, under the pope, of the aggregated communities throughout Christendom belonging to a religious order. The governing authorities of the monastic orders in the Roman Catholic Church may be arranged in three classes: (1) the superiors of convents or communities, called variously abbot, prior, rector, or guardian; (2) the provincials, who have authority over all the convents of a 'province'; (3) the general, to whom not only each member of the order, but all the various officials of every rank, are absolutely subject.

**General**, or **General Officer**, an officer of the general staff of an army. In the United States Army, the term applies to all officers above the grade of colonel, who are unofficially addressed as 'general,' their actual grades being brigadier, major, and lieutenant general respectively in ascending order. The office of general is next above that of lieutenant general, and exists only when specially created by Congress. See **ARMY OF THE UNITED STATES; STAFF**.

**General Assembly**, in Scotland, Ireland, and the United States, denotes the highest court of the Presbyterian Church. It has judicial and legislative powers, acting as a court of appeal, and determining cases referred to it by the inferior courts; it also exercises a general superintendence over the discipline of the church. In its legislative ca-

capacity it enacts statutes binding on the assembly itself and on the inferior courts. See **PREBYTERIANISM**.

**General Education Board**, an organization formed by John D. Rockefeller in New York City in February, 1902, and incorporated by Act of Congress of Jan. 12, 1903, to promote the general cause of education throughout the United States, irrespective of race, sex, or creed. Funds contributed by Mr. Rockefeller to the Board have been given outright and absolutely. Principal as well as income may be used for the corporate purposes of the Board.

The gifts of the Board have been mainly for endowment and other capital purposes of colleges of liberal arts; for medical education; for research and graduate study in education, the natural sciences, and the humanities; for public education in the South; and for the education of the Negro.

**Generalization**, the act of comprehending under a general name a number of objects which agree in one or more points. The result of generalization is a common name or general term, which stands for the many objects in so far only as they all agree.

**General Lien**. See **Lien**.

**General Staff**, an organization in an army consisting of a number of selected officers appointed to assist and to carry out the general principles of a general commanding officer.

In the United States, the General Staff Corps was created by Act of Congress on Feb. 14, 1903. It is composed of about fifty officers detailed for a period of four years under rules prescribed by the President. The duties of the General Staff are numerous and comprehensive, and are definitely set forth in the General Staff Act and in Army Regulations. See **ARMY OF THE UNITED STATES**.

**General Theological Seminary**, The, chief divinity school of the Protestant Episcopal Church, is situated in New York City. It was founded in 1817; incorporated in 1822; and in 1825 construction was begun on some of the buildings which it now occupies in Chelsea Square. The course, partially elective, covers three years, with provision for graduate work. It includes the study of Hebrew; Biblical history and literature; theology; apologetics, liturgics, pastoral care, pedagogy; ecclesiastical history, law, and music; ethics; and elocution. The degrees of D.D. and B.D. are conferred, the latter both academic and honorary. Applicants for entrance are required to be either accepted candidates for orders in the Protestant Episcopal Church,

or graduates in arts of recognized colleges or universities.

**Generation**. See **Reproduction**.

**Generation**, a single succession in natural descent, the children of the same parents.

**Generations, Alternation of**. See **Alternation of Generations**.

**Generation, Spontaneous**. See **Spontaneous Generation**.

**Generator, Electric**. See **Dynamo and Motor**.

**Genesee River**, river rising in Potter co., Pennsylvania, and flowing n.w. nearly across Allegany co., New York, and then n.e. to Lake Ontario, passing through the city of Rochester. It is about 135 m. long and its lower course is in a broad and fertile region, well deserving of the Indian designation of 'pleasant valley.' At Rochester, where it is crossed by the Erie Canal, there is a sheer fall of 95 ft., which is utilized for water power.

**Genesee Shale**. See **Devonian**.

**Geneseo**, village, New York, county seat of Livingston co., on the Genesee River. It is the seat of a State normal and training school; has a canning factory and manufactures jam, flour and gloves; p. 3,133.

**Genesis**, the first book of the Bible. The book falls into two main parts: (1) a rapid survey of primeval history, giving the 'generations' of the heavens and the earth, Adam, Noah, Noah's sons, and, in particular, Shem; (2) a more detailed account of the patriarchs Abraham, Ishmael, Isaac, Esau, Jacob and his twelve sons. The last chapters show Jacob and his sons in Egypt, and when the curtain rises again in Exodus these have grown to a great people, the children of Israel. The whole delineation is transfused with a lofty ethical and religious interest.

**Genêt**, or **Genest**, **Edmond Charles** (1765-1834), French diplomat, was born in Versailles. At the time of the French Revolution, 1792, he became Minister to the United States, and on his arrival in this country endeavored to influence public opinion to uphold France in her war against England. Despite President Washington's proclamation of neutrality, he proceeded to arm and equip privateers and raise recruits in American ports; and this, with his many imprudent criticisms of the United States Government, compelled the latter to demand his recall, 1794.

**Genetics**, that branch of biology which deals with the coming into existence of new individuals under the orderly operation of the



laws of heredity. The name genetics was suggested by the late W. Bateson for the rapidly increasing knowledge developed through the rediscovery of Mendel's law in 1900. Previous to that discovery it was already known that new individuals arise in sexual reproduction through the union of two reproductive cells, one furnished by each of the respective parents, and that these cells are the vehicles of inheritance from the parents. It had also been suggested that particular structures within the germ-cells, known from their stainability as chromosomes, were specially concerned in heredity, but no direct evidence for this view was then known. Intensive study of the chromosomes had shown that their numbers and shapes were very definite and characteristic for each species of animal or plant. In general the new organism has twice as many chromosomes in each of its constituent cells, as were found in the egg or in the sperm from which it developed. In some cases, however, egg and sperm in the same species have slightly different chromosome numbers, in which case the chromosome number in the progeny is equal to the sum of the number of chromosomes in the egg plus the number in the sperm.

It has now been established beyond question that the chromosomes are the actual physical bearers of heredity. Each chromosome transmits a particular set of inherited characters. The transmission is not of characters as such but of materials which will cause the development of the characters in question under normal conditions. The thing transmitted is called a gene. It is a chemical substance which will cause a definite effect in a particular part of the developing organism. The egg of a rabbit contains 22 chromosomes, the sperm contains the same number, and the fertilized egg resulting from the union of an egg and a sperm contains 22 pairs of chromosomes. Genes are known which are transmitted in seven different pairs of these chromosomes.

In a particular one of the 22 chromosomes of an egg (or a sperm) is a gene which determines whether the coat of the rabbit shall be gray or a plain color. In a second chromosome is a gene which determines whether the hair color shall be intense or dilute. In a third chromosome is a gene which determines whether the coloration of the hair shall be black or yellow. In a fourth chromosome is a gene which determines whether the hair shall be of normal length or abnormally short and plush like. A fifth chromosome has a

gene deciding whether the coat is to be white or is to be normally colored. Two other chromosomes contain three known genes each. In one of these is found (a) a gene determining whether the eyes and coat are to be colored or uncolored, (b) a gene determining whether the color of eyes and coat shall be black or brown, and (c) a third gene which determines whether the body fat shall be yellow or white in color. These three genes are strung on the thread-like chromosome in a definite order and at definite distances apart, as we infer from certain accurately determined features of their behavior in varietal crosses. In the other chromosome which bears three known genes, are found (a) a gene which determines the 'checkered' type of white spotted coat found in the English rabbit and in 'checkered giants,' (b) a gene which determines the Dutch belted type of spotted coat, and (c) a gene which determines whether the coat shall be long and silky or of normal length.

Undoubtedly all the other chromosomes of the rabbit also carry genes, but we have not yet learned what they are. A gene becomes known to us only when it occurs in two different states in different individuals or varieties of the species. By crossing such individuals or varieties we can demonstrate the existence of a gene in more than one form and trace the course of its descent in later generations and its relation to other known genes. This is possible through a knowledge of Mendel's law.

What happens when a gene occurs in two different forms in the same individual? As a rule only one form is expressed (the dominant one in terms of Mendel's law) but both are transmitted to different offspring. Half the offspring receive one form, half the other. For example suppose we cross an angora rabbit (long haired) with an ordinary rabbit. The young will have hair of ordinary length, ordinary hair length being dominant, angora recessive. The chromosome carrying the gene for angora will in the crossbred individual lie alongside of another carrying the gene for ordinary hair length, but only the latter will find expression. But at reproduction this pair of chromosomes (like every other pair) will be reduced to one. Only one of the pair will be present in a particular egg or sperm, which accordingly will transmit either angora or normal hair length, but not both. The familiar 3:1 ratio of Mendelian inheritance follows as a direct consequence of the production by cross-bred individuals of two

classes of eggs or sperm. See MENDEL'S LAW.

The chromosome mechanism of inheritance, illustrated in the case of the rabbit, is of general occurrence throughout the plant and animal kingdoms including man. The most thoroughly studied case is that of the banana fly, *Drosophila*, in the inheritance of which several hundred genes are known to be involved, all being borne in four pairs of chromosomes, each of which constitutes a different linkage group.

**Genette**, a small animal allied to the civet. The common genette is found in the s. of France and in Spain, as well as in Africa; all the other species are African.

**Geneva**, canton, Switzerland, in the southwestern part, with Lake Geneva to the n., and France on the e, s. and w. The chief branches of industry are gardening, vine and fruit growing, and the manufacture of articles of jewelry and watches; p. 171,000.

**Geneva**, city, Switzerland, capital of the canton of Geneva, situated on both sides of the Rhône, at its outlet. The old city lies on the left bank; the Quartier St. Gervais, inhabited mainly by the industrial classes, is on the right bank. The Cathedral of St. Peter is Byzantine in character, and is said to have been built in 1124. Nine bridges span the Rhône. Other places of interest are Calvin's house; the 16th-century Hôtel de Ville; the Botanical Gardens and the University founded by Calvin in 1559; and several museums including the Musée Rath, the Fol Museum, the Athenæum, and the Museum of Natural History.

Geneva has become important as an educational center. As an industrial city it is renowned for its clock, watch, musical box, scientific instrument, and jewelry manufactures. Diamond cutting and enamelling are also important industries.

Geneva was a place of some importance as early as the 4th century A.D. In the 11th century it passed into the hands of the emperor Conrad II., becoming an imperial city under the local administration of its bishops. During the French Revolution Geneva was annexed, 1798, to France, but on the fall of Napoleon it regained its liberty and in 1814 joined the Swiss Confederation.

Since the World War, its importance has rapidly increased as a center for international discussions, as it is the seat of the League of Nations (first Assembly meeting on May 15, 1920), the International Red Cross, and the International Labor Office of the League of Nations; p. 135,059.

**Geneva, Lake of**, a crescent-shaped lake, lying between the French department of Haute-Savoie and the Swiss cantons of Geneva, Vaud, and Valais. Its greatest length is 45 m., its maximum breadth 9 m., and its total area 225 sq. m. At the eastern extremity of the lake stands the castle of Chillon.

**Geneva**, city, New York, in Ontario co., at the head of the Seneca and Cayuga Canal and at the foot of Seneca Lake. The chief manufactures are motors and motor boats, eyeglasses, stoves, tin cans, and steam and water-heating boilers. There are large fruit and ornamental-tree nurseries. Geneva is the seat of Hobart College, William Smith College, the N. Y. Agricultural Experiment Station, Smith Astronomical Observatory; p. 15,543.

**Geneva Arbitration.** See **Alabama, The.**

**Geneva Bible.** See **Bible.**

**Geneva College**, a coeducational institution of higher learning, founded in 1848, under the auspices of the Reformed Presbyterian Church in Northfield, Ohio, and moved in 1880 to Beaver Falls, Pa.

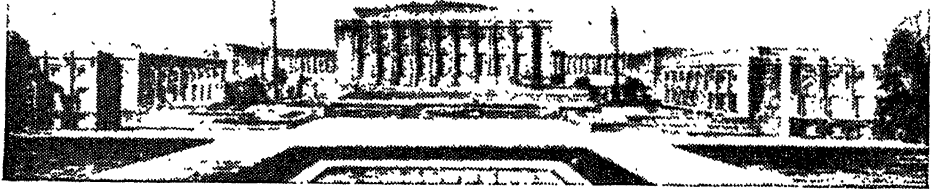
**Geneva Convention**, an agreement concluded at an international conference held in Geneva in 1864, which established rules for the amelioration of the condition of the sick and wounded in war. It was signed on Aug. 22, 1864, by the representatives of twelve European states and Persia, and afterward acceded to by practically every civilized nation. The calling of the conference was an indirect outgrowth of conditions seen on the battlefields in the Crimean War and the war between France and Sardinia, and was largely due to the efforts of Henri Dunant and Gustav Moynier. The convention provided for the neutrality of ambulances and military hospitals and the persons employed therein, even after occupation by the enemy; that the equipment of military hospitals is subject to capture, but ambulances retain their equipment; that inhabitants of the country who bring help to the wounded shall be respected; that the presence of a wounded man brings protection to a house, and any inhabitant who has entertained wounded men is exempted from quartering of troops and payment of war contributions; that wounded or sick soldiers of any nationality shall be cared for until cured, or may be delivered at the outposts of their army; that those who are recognized as incapable of serving shall be sent back to their country, and others may be sent back on condition of not serving again during the war. A distinctive flag with a red

cross on a white ground was adopted for hospitals, ambulances, and evacuations, and an arm band similar to the flag for individuals neutralized. In 1868 a series of additional articles were signed, whereby the neutral status of military hospitals and the persons engaged in their service was extended to hospital ships. These are painted white, with green strake. The principles of the Geneva Convention were extended to naval warfare by the Hague Peace Convention of 1899.

**Geneviève** (?422-512), the patron saint of Paris, was born in Nanterre, a town seven miles from Paris. When a mere child, 429, she

tiny, and accompanies him through life as his tutelary spirit. Juno is the corresponding influence in a woman's life and in households inhabited by a man and his wife a Genius and a Juno were worshipped, particularly on their respective birthdays, when offerings of wine, cakes, and garlands were presented.

**Genoa**, province of Italy, between the Northern Apennines and the Ligurian Sea, or Gulf of Genoa; embraces the coast tract of the Riviera, which enjoys a mild and salubrious climate, and produces abundance of fruit; shipbuilding, ironworking, and textile manufactures are carried on; p. 975,700.



*Geneva: New League of Nations Building.*

was dedicated to the Lord by Bishop Germanus of Auxerre. About 437 she removed to Paris where she took the veil and devoted herself to works of charity. After her death her relics brought such fame to the basilica of Peter and Paul that its name was changed to that of Sainte Geneviève. Her relics were taken to Athis before the Norman occupation of Paris, 857, but on their return a stately church was erected in her honor, 1177-80. This was demolished in the 18th century and a new edifice, now known as the Pantheon, was erected by Louis xv. in 1764-90.

**Genghis Khan.** See **Jenghiz Khan**.

**Genipap**, the fruit of a tropical evergreen tree belonging to the order Rubiaceæ. It grows chiefly in Northeastern South America and the West Indies, reaching a height of 60 or more ft.

**Genista**, a genus of dwarf shrubs belonging to the order Leguminosæ.

**Genitrix** 'the mother,' a title given by Ovid to Cybele; also a surname of Venus.

**Genius**, among the Romans, a higher power which creates and maintains life, assists at the begetting and birth of every man, determines his character, influences his des-

**Genoa**, seaport and fortified city, Italy, the chief town of the province of Genoa, is built as a sort of amphitheatre on the seaward slope of a lofty range of hills overlooking the Gulf of Genoa. It consists of an old town with short narrow streets, and the new quarters, to the n. and northeast, with wide, open thoroughfares. There are many Renaissance palaces, several of which are now used as picture galleries. Among them are the Palazzo Reale, the Palazzo Durazzo Palavicini, the Palazzo Rosso, the Palazzo Bianco, and the Palazzo Municipale or Town Hall. Other features of interest are the Church of the Annunciation, the Cathedral, founded in 987 and restored in 1307, the University, housed since 1812 in the Palazzo del Università; and the Staglieno Cemetery, which occupies an area of 383 acres overlooking the city and contains many fine tombs and sculptures. The harbor, which has been greatly improved and extended, is important for its import trade in coal, grain, and cotton.

Besides being one of the principal commercial ports of Italy, Genoa is also one of its busiest industrial centers. The chief branches of activity are shipbuilding, iron

foundries and iron works, sugar-refining, tanning, cement making, the manufacture of cotton, macaroni, ornaments for personal wear, leather goods, preserved fruits and chocolate; p. 659,000. The foundation of the city of Genoa is roughly contemporary with the building of Rome. During the 11th and 12th centuries it grew into a powerful maritime state, and not only took part in the crusades, but established settlements in the

Mediterranean Sea, lying to the s. of Liguria, between Spezia and Oneglia. At its head stands the city of Genoa.

**Genre Painting**, in art, a term applied to paintings depicting familiar scenes of rustic or domestic life, and all homely figure subjects not coming under the designation 'historical.'

**Gens**, a Roman term comparable to the term 'clan.' The members of a gens claimed



*Photo by Ewing Galloway, N. Y.*

*Campo Santo, Genoa, Remarkable for its Sepulchral Monuments by Famous Sculptors.*

Levant and even in the s. of Russia, and was also mistress of the island of Corsica. After being alternately a dependency of France and Milan, the city at length, 1528, came under the protection of the Emperor Charles v., though the real power rested with Andrea Doria until his death in 1560. In 1797 Bonaparte constituted the Ligurian republic from the Geniovese dominions. On the fall of Napoleon the city of Genoa and its territories were annexed to the kingdom of Sardinia, 1815.

**Genoa, Gulf of.** a northern part of the

descent from a common ancestor and bore a common name. Of the three names borne by every Roman, the name-in-chief, which was the middle name, was that of his gens.

**Genseric**, king of the Vandals from about 429 to 477 A.D. In 429 he invaded Africa, on the invitation of Boniface, Count of Africa, and finally took possession of all the Roman provinces, capturing Carthage, 439, and making it his capital. In 455 he seized Rome and sacked it.

**Gentian**, a genus of hardy plants of the or-

der *Gentianaceæ*. Our most beautiful native species is the widely known fringed gentian, an erratic biennial, which is often found in immense colonies in damp soil; stout plants with many erect branches, opposite leaves, and in late autumn many exquisite azure blossoms, with square calyx and twisted, conical buds, opening in sunshine, and displaying four delicately fringed petals.



*Fringed Gentian*

**Gentile da Fabriano.** See **Fabriano**.

**Gentiles**, a name applied in Scripture to the non-Israelite nations; it came, particularly after the exile, to carry the disparaging sense of 'heathen.'

**Gentleman.** In Europe this term is applied to one of gentle birth and conduct, having the right to armorial bearings, but below the grades of nobility; an order that began to exist as a separate class in England, according to Freeman, early in the 11th century. Popular usage has extended the name to all men possessing the higher attributes of manhood, as well as refinement and education.

**Gentlemen - at - Arms.** The Honorable Corps of Gentlemen-at-Arms of the British court originated in the 'King's Pensioners and Spear-men,' a body formed in 1509 out of the cadets of noble families by Henry VIII. as a mounted guard to his person.

**Genus**, in biological nomenclature, is a group of similar species, while a group of similar genera constitutes a family. No hard and fast line can be laid down as to whether a group of related animals or plants should be placed in one or in several genera. but in

all cases the characters which distinguish one genus from another must be greater than those distinguishing the species of the genera.

**Geocentric**, a term used in astronomy for an orbit having the earth for its center. The term is distinguished from heliocentric.

**Geodes**, in mineralogy, are cavities lined with crystals.

**Geodesy**, a term employed for the determination of the form and dimensions of the earth, or of large areas of it. The operations of geodesy consist of determining the length, azimuth, position, and altitude of a base-line, usually a few miles long, the ends of which are visible each from the other, and between which the ground is level. Transit instrument and theodolite may be used for the angular and time observations, and rods or wires for measurements of length. The instruments used must be of the most delicate accuracy, and all the necessary corrections for refraction, instrumental errors, etc., applied. The measuring rods or wires should be compensated for changes of temperature, properly levelled, kept from sagging, adjusted by micrometer screws, and read through microscopes. Special steel tapes may be used in all but the finest work. In measuring the Houlton, Mich., base by the U. S. Coast and Geodetic Survey, the bars were kept at the temperature of melting ice in convenient troughs. A theodolite is employed to direct the alignment of the rods or tapes. The lengths have to be reduced to sea-level. The positions of the terminal points of the base and its azimuth are determined, while bearings are taken to prominent objects, natural or artificial, which form the angular points of the first triangles; from which, by similar observations, new triangles are obtained, until a network, either of interlaced or of successive primary triangles, is obtained. From this is calculated the length of a meridian arc, the position of whose ends is precisely determined. Much valuable material will be found in the annual reports of the U. S. Coast and Geodetic Survey.

**Geodynamics**, the branch of science that deals with the forces which act on the earth's surface and bring about transformations, whether rapid or slow. It has also been termed geophysiology, and is used in contrast to geomorphology, which deals with the shapes of the successive transformations.

**Geoffrey of Monmouth** (?1100-1154). Welsh monk and chronicler, chaplain till 1128 to William, Count of Normandy, and subsequently bishop of St. Asaph, 1152. He

was the author of the *Historia Regum Britanniae* (ed. Schulz, 1854), which gave so great an impulse to the formation of the Arthurian literary cycle. Besides the *History*, Geoffroy wrote *Prophetia Anglicana Merlini* and *Vita Merlini* (ed. Fr. Michel, 1837).

**Geoffroy Saint-Hilaire, Etienne** (1772-1844), French naturalist, born at Etampes. He published *Philosophie Anatomique* (1818-20), *Sur le Principe de l'Unité de Composition Organique* (1828), and *Philosophie Zoologique* (1830). The principle which he maintains through his works is that of the unity of all organic composition—the point on which his celebrated controversy with Cuvier turned. See *Life*, in French, by his son (1847); also *Cuvier et Geoffroy Saint-Hilaire* (1890), by Ducrotay de Blainville, and for his views on species, consult Packard's *Lamarck, His Life and Work* (1901).

**Geoffroy Saint-Hilaire, Isidore** (1805-61), French naturalist, son of the preceding, born at Paris, acted as assistant to his father. He was the founder (1854) and president of the Acclimatization Society in Paris. Among his works are a *Life* of his father (1847); *Histoire des Anomalies de l'Organisation chez l'Homme et les Animaux* (1832-7); *Essais de Zoologie Générale* (1841).

**Geographical Distribution.** (1.) **ANIMALS.**—If we consider the inhabitants of any particular region of the earth's surface, we find that, with rare exceptions, neither plants nor animals are uniformly distributed throughout the area in which they occur. The primary reason for the want of uniformity in distribution is to be sought in the existence of barriers to the migration of land animals. Thus the range of the Himalayas prevents to a large extent the passage of animals either from or to the s., whence we have the marked distinction between the fauna of India and that of Asia n. of the Himalayas; the desert of Sahara similarly cuts off the fauna of the greater part of the African continent from that of Europe and Asia; the great island continent of Australia is cut off by the ocean from all communication with the rest of the animal world, save such as can cross the sea by swimming or by flight. Other barriers of minor importance are climate, large rivers, humidity, and so on. By such barriers the surface of the earth is more or less distinctly marked off into regions, each characterized by its own group of animals. It is chiefly by the distribution of the land mammals that these regions have been defined.

The simplest scheme, and that adopted by

Dr. A. R. Wallace, recognizes the following six regions:—(1.) The Palæarctic, including Europe, temperate Asia, Africa n. of the Atlas Mountains. (2.) The Ethiopian, including Africa s. of the Atlas Mountains, with the island of Madagascar. (3.) The Oriental, comprising India s. of the Himalayas, Further India, Southern China, Sumatra, Borneo, Java, and other islands of the Malay Archipelago as far s. as Bali. (4.) The Australian, comprising the continent of Australia, with New Guinea, Celebes, Lombok, and the islands of the Pacific. (5.) The Nearctic, including N. America as far s. as Mexico. (6.) The Neotropical, including Central and S. America, with the W. Indies.

The following scheme is taken from Lydekker's *A Geographical History of Mammals* (1896), in which a historical account of the different schemes proposed will be found. (1.) *Arctogæic Realm*, including Europe, Asia with India, Africa, N. America, and divided into the following regions:—Holarctic region, which includes the Palæarctic and Nearctic regions; Oriental region; Ethiopian region; Malagasy region; Sonoran region. (2.) *Neogæic Realm*. (3.) *Notogæic Realm*, including Australia, with the following regions:—(a) Australian region, with Australia, Tasmania, and New Guinea; (b) Austro-Malayan region, certain islands lying between New Guinea and Bali; (c) Polynesian region, New Zealand and certain of the islands of the Pacific from which the Sandwich Islands and some others are separated, as the (d) Hawaiian region.

In the Holarctic region we have among mammals, marmots, beavers, reindeer, bison, elk, glutton, sheep, bear, while the Nearctic sub-region has such peculiar forms as the prongbuck, the skunk, the raccoon. Many birds and fish are common to the two sub-regions, which are indeed closely related. In the Oriental region we have pangolins, many deer, chevrotains, cattle, pigs, a tapir, elephant, rhinoceros, civet, hyæna; many large cats—tiger, leopard, panther, etc.; many mice, squirrels and bats; monkeys, and anthropoid apes (gibbon and orang); many pheasants, hornbills, coral-snakes, crocodiles and so on. In the Ethiopian region we find a multitude of large ungulates—elephant, hippopotamus, giraffe, rhinoceros, zebra; a host of antelopes; lion, leopard, panther, and other carnivores; lemurs, monkeys, and anthropoid apes (gorilla and chimpanzee); *Hyrax*; aard-vark, turacos and plantain-eaters, sun-birds, bee-eaters, weavers, chameleons, many vipers,

crocodiles, lung-fish, and two ganoids. In the Malagasy region we have a great development of lemurs, the civet-like *Cryptoprocta*, the hedgehog *Centetes*, while numbers of the typical African mammals are absent. In the Sonoran region there is a certain mingling of Nearctic and Neotropical forms. In the Neotropical region we have sloths, armadillos, and ant-eaters, the llamas and their allies, tapir, peccary, an enormous number of rodents, no horse, sheep, goats, nor antelopes, Cebidæ or New World monkeys, marmosets, opossums, humming-birds, and many other peculiar birds, alligators, crocodiles, iguanas, many frogs, the lung-fish (*Lepidosiren*), and so on. The Australian region is characterized by the great development of marsupials or pouched animals, and the exclusive possession of the monotremes. In the Austro-Malayan region there is an intermixture of Australian and Oriental types. In the Polynesian region there are practically no non-flying mammals, save a mouse (possibly introduced) in New Zealand, and the gray cuscus and four mice in the Solomon Islands. The Hawaiian region, equally devoid of mammals, is entitled to be regarded as distinct on account of its birds.

Aquatic forms can also be divided according to the nature of their special habitat. Thus, one would distinguish between marine and fresh-water animals in the first place; and in the case of the marine forms it is possible to distinguish between a *littoral* fauna, including animals adapted for life near the margin of the land—shore animals in the wider sense; a *pelagic* fauna, including the forms adapted for life in the open sea; and an *abyssal* fauna, including those which live only in the great depths. See A. R. Wallace's *Geographical Distribution* (2 vols. 1876), and *Island Life* (1880); A. Heilprin's *The Geographical and Geological Distribution of Animals* (1887); F. S. Beddard's *A Text-book of Zoogeography* (1895).

(2.) PLANTS.—One of the earliest references in the English language to the distribution of plants and animals occurs in Gilbert White's fortieth letter to Pennant. He says that Linnæus ranges plants geographically: palms inhabit the tropics, grasses the temperate zones, and mosses and lichens the polar circles. A much fuller account of the opinions of Linnæus on the subject is to be found in the *Amœnitates Academicæ* (1749-90). Alexander von Humboldt comes next, and Drude claims that he has the same right to be considered the founder of botanical geography that Darwin has to be reckoned as

the founder of the theory of descent. Humboldt seems to have been the first to suggest the value of distributional maps. Climate and soil were the factors on which he laid the chief stress. In 1823, J. F. Schouw, a Danish botanist, divided the earth's land-surface into eighteen kingdoms, some of which were subdivided into provinces. A few had geographical names, though most were designated from the characteristic flora, which was necessarily the criterion. A few years later Meyen put forward his scheme of zones, adopting parallels of latitude as boundary lines.

De Candolle's geographical grouping of plants was governed by the amount of heat required for their proper development. Those needing a maximum of heat he called *megatherms*; those of the warm temperate zones, *mesotherms*; those of the cool temperate zones, *miotherms*. Grisebach's work was based on the theory of evolution, and is noteworthy for its recognition of the influence of environment in the production of local forms, and the development of these into species. Engler came to the conclusion that the most extensive changes in the vegetation of a given region corresponded to geological changes. His 'elements' were: *Arcto-Tertiary*, distinguished by abundance of conifers, and many genera of trees and shrubs which are now predominant in North America, Europe, and that part of Asia lying n. of the tropic of Cancer; *Palæotropical*, marked by certain families formerly dominant in the tropical region of the Eastern Hemisphere, and by the absence of families characteristic of the Arcto-Tertiary elements; *Neotropical* or *South American*. This flora must have had the same characteristics as that of tropical Brazil and the West Indies at the present time; *Old Oceanic* element, composed of plants capable of distribution across intervening stretches of water, and of development on islands and island groups.

Drude was content with three main groups, and his primary divisions were fewer than those of Engler. His scheme was: *Boreal group*, with five divisions: Northern, Inner Asiatic, Mediterranean, East Asiatic, and Central North American; *Tropical group*, with four divisions: Tropical African, East African Islands, Indian (including Polynesian), and Tropical American; *Austral group*, with five divisions: South African, Australian, New Zealand, Andine, and Antarctic. Engler and Drude have more in common than any other two authors referred to, the main dif-

ference being the tendency to over-refinement evinced by the former in his subdivisions. Consult A. R. Wallace's *Geographical Distribution of Animals and Island Life*; A. Murray's *Geographical Distribution of Mammals*; A. F. W. Schimper's *Plant Geography* (Eng. trans. 1903); Brunkes' *La Géographie Humaine* (1910); E. C. Semple's *The Influence of Geographic Environment* (1911).

**Geographical Society, American**, was organized in 1852 in New York to 'encourage geographical exploration and discovery; to investigate and disseminate new geographical information; to establish in the chief maritime city of the country, for the benefit of commerce and navigation, a place where the means will be afforded of obtaining accurate information for public use of every part of the globe.' The Society maintains one of the foremost geographical libraries in the world. There is a fine collection of sixteenth, seventeenth, and eighteenth century atlases. The Society publishes a *Bulletin*. It has assisted materially in Polar exploration.

**Geographical Society of Baltimore** was founded in 1902, and exists for promoting an interest in geography.

**Geographical Society of Philadelphia** was founded in 1891, received its charter in 1893, and took its present title in 1897. It supplies funds for exploration, and gives annually the Elisha Kent Kane medal for geographical work. It has a library, and issues a bulletin.

**Geographic Society, National**, an association for the increase and diffusion of geographic knowledge, founded in 1888 in Washington, D. C. It publishes every month *The National Geographic Magazine* and many large maps; gives an annual series of addresses; and assists worthy projects of exploration. It has been associated with Arctic and other expeditions, and has sent expeditions to Alaska, Mont Pelée, and Peru. The membership, which is not confined to professional geographers, is about 1,300,000.

**Geography** (Greek *gē*, 'the earth'; *graphein*, 'to describe'), a description of the earth. The term is usually applied to that department of science which comprises an investigation of the features of the earth's surface, and the distribution and mutual topographical relations of all which that surface sustains. It thus includes the study of the atmosphere or air covering; the geosphere or land surface; and the hydrosphere or water covering. To understand what may be regarded as the subject proper of geo-

graphy some knowledge is required of the relations of the earth to the solar system and the celestial sphere generally. This department is treated in text-books under the heading of *Astronomical* or *Mathematical Geography*.

An elementary acquaintance is also advisable with certain physical and chemical facts and laws. This is often included, along with a study of the features themselves, in *Physical Geography*. The investigation of the ocean and its denizens is considered under the title *Oceanography*. To an account of the different states or communities into which man is divided the term *Political Geography* is commonly applied. *Commercial Geography* discusses the various countries and regions of the earth with special reference to their products and their requirements as affecting trade and commerce.

By the time of Eudoxus and Aristotle philosophers accepted the spherical theory of the earth's shape. Aristotle, following Parmenides, extended the ideas of zones of the sphere; and Eratosthenes (276-195 B.C.) using thoroughly sound theoretical conceptions, measured a meridional arc more accurately than Dicaearchus had previously done, and placed reference lines on his maps. Aristotle knew the connection between sea, rain, springs, and streams. Posidonius, the most intelligent of ancient travelers, wrote a work on the ocean; and Pytheas of Marseilles correlated the tides with the phases of the moon. Early attempts were made to interpret historical facts in terms of geographical facts, especially by Ephorus (first half of the fourth century B.C.) and Polybius (c. 204-c. 122 B.C.).

With the growth of Roman power and practical ideas geography took a new trend, and the descriptions of the vast empire became of great national and intellectual interest. What theories were developed came in association with astronomical work, and Ptolemy (c. 150 A.D.) of Alexandria not merely enunciated the theory of the universe, but, using data collected by Marinus of Tyre, gave the position of three hundred and fifty places. For 1,300 years geography did not flourish in Europe. With the fifteenth century began the revolution in the conception of the universe involved in the substitution of the heliocentric for the geocentric idea. The adventures of Marco Polo (1271-95), increased the knowledge of the Far East, and led to the exaggerated estimate of the extension of the world from e. to w. Italian navigators, whose Mediterranean trade had

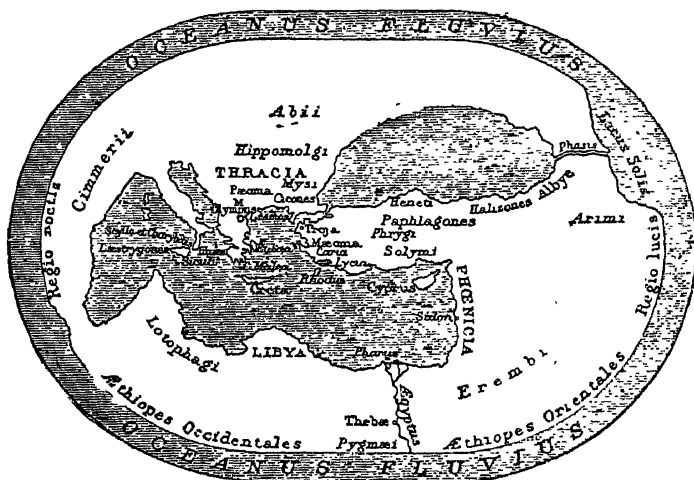


been checked, took the lead in the new expeditions. The doubling of the Cape by Diaz (1486), and the first voyage to India by Vasco da Gama (1498), were events of infinite practical significance; but the first voyage of Columbus across the Atlantic (1492) to what he believed to be the e. of the Old World was as much more daring physically as it was intellectually more revolutionary. The coasts of Africa, Asia, and America, except in the n., were soon known.

The importance of the chart for the mariner resulted in the development of *Cartography*. One book stands out at an early period as a fundamental work—the *Geogra-*

Heinrich Berghaus, of which an edition was prepared for Britain by Petermann and Keith Johnston. His great contemporary, Karl Ritter (1779-1859), has left almost as great an impression on the history of geography.

In more recent years the scientific foundation of geography has gained needed strength by a hearty acceptance of the principles of evolution, inorganic and organic. The subject may be studied in two ways: systematically and regionally. Systematic geography has two chief divisions. The first contains all the inorganic elements of the subject, and is ordinarily called physical geography, or, more briefly, physiography; its divisions are: the



*The World According to Homer.*

*phia Generalis* of Varenus (1650). Kant lectured on physical geography from 1755. The basis of geophysics was prepared more from the physical than from the geographical point of view by the investigation into the relation of the earth to the solar system, gravitation, the tides and the mean density of the earth, carried on by Newton, Euler, D'Alembert, Leibniz, Laplace, Cavendish, and others. The greatest geographer, Alexander von Humboldt (1769-1859), not only assimilated all this new knowledge, but added much to the store by his travels in both the new and old worlds, and by his special investigations. His *Cosmos* (1845-58) is a classic. To him we owe not merely the use of isotherms (1817) and the beginnings of scientific morphology (mean height of the continents, 1843), but also the inspiration of the first great physical atlas (1838-48), associated with the name of

earth as a globe, the atmosphere, the oceans, and the lands. These divisions are further subdivisible; thus the ocean may be studied as to composition, density, movements (waves, currents, and tides), and other general features. The second or organic division of geography includes plants, animals, and man, considered with especial regard to all those elements of life which bring about a relation to inorganic environment, such as need of food, of shelter, and (in the case of man) of clothing; and the term ontography has lately been suggested as one under which all these elements should be brought together in form for geographic consideration.

Regional geography (sometimes called chorography) is concerned, in its modern scientific aspect, with the study of physiographic and ontographic items in their geographical relations as occupants of terrestrial spaces.

The spaces or regions may be either natural or political areas. The thorough development of regional geography, on a basis of sound systematic geography, has as yet made little advance except in the treatment of parts of civilized countries; much work of this kind remains to be done even there. Modern scientific geography has become so compendious a subject that it is seldom mastered in its entirety by one person; in its advanced treatment, in particular, specialization has become customary, so that single topics, such as glaciers or tides, may occupy nearly the whole attention of a professional student. The subject has suffered greatly in Great Britain and the United States by reason of its relative neglect in the universities. This difficulty has not prevailed in continental Europe, and it is in course of being overcome in English-speaking countries. Consult: Keltie and Howarth *History of Geography* (1913); Semple *Influence of Geographical Environment* (1911); Smith *Industrial and Commercial Geography* (1913); R. A. Daly *Our Mobile Earth* (1926).

**Geological Society of America.** An association formed in 1888 for the promotion of geologic science. Its membership is international. The society holds an annual meeting and publishes a *Bulletin*.

**Geological Surveys.** The Geological Survey of Great Britain was the first national survey to be instituted, and it was mainly through Sir Henry de la Beche that it was established in the years 1834 and 1835. Other nations rapidly followed suit, and the surveys of the United States, Germany, Canada, France, and Austria now hold a high place. The functions of such a survey are the publication of geological maps; the issue of printed memoirs explanatory of these maps; the collection of information respecting the geological structure of the country; the study of the natural geological resources of the state, and of the best means of developing them. The Geological Survey of the United States as now constituted was organized in 1879. The work was outlined on very wise and broad lines, is conducted with great efficiency, and for both matter and workmanship the publications rank second to none in the world. The publications include: Annual Reports, Monographs, Bulletins, Professional Papers, Mineral Resources, Physiographic Atlases, Geologic Folios, Topographic Maps, Bulletins on Water Supply and Irrigation, Miscellaneous maps, Annual Report of the Reclamation Service. The chief departments of the survey are topo-

graphic, geologic, and hydrographic. It is under civil-service regulations. There is a large staff, and young men regularly prepare for this work in our larger universities.

**Geology.** The science of geology is concerned with the investigation of the structure and history of the earth's crust. Its business is to interpret the record of the past as that is revealed to us in the rocks which are exposed to our observation on the earth's surface. Their chemical composition, the association of minerals to form different kinds of rock, the disposition of the strata and the manner in which they have originated and have been altered or disturbed, are the principal subjects embraced in that part of the science which is known as *physical* or *dynamical geology*. The stages of the earth's history, the chronological succession of the strata and the grouping of the individual members are regarded as a distinct branch known as *stratigraphical* or *historical geology*.

Though by means of wells, borings, and tunnels it is possible to ascertain directly the condition and nature of the underlying rocks, yet this has been done only in a few areas; and as the greatest depths to which the engineer has penetrated are not much more than one mile, only one four-thousandth part of the earth's diameter has been probed in this way. Yet we know that the earth is about five and a half times as heavy as an equal bulk of water, that it is as rigid as a ball of steel, and that the pressures to which its deeper parts are subjected must be enormously great. Even of the earth's surface the geologist can be said as yet to have examined only an inconsiderable portion. The great oceans conceal their beds from view; the snow fields of the polar regions obstruct geological research as effectively as do the sands of deserts and the deep forests of tropical zones. The fossils contained in the rocks serve a twofold purpose. They indicate under what conditions the strata accumulated, whether land or fresh water, marine or estuarine. One bed may yield land-shells and roots of trees; another is composed of corals and crinoids—inhabitants of clear sea water. They also furnish a record of the sequence of living types. The age of invertebrates was followed by that of the fishes; thereafter the amphibians, the reptiles, and last of all the mammals, in turn dominated the stage. No one had taken a broad and sound view of the whole field of investigation before James Hutton wrote his great work on the *Theory of the Earth* (1785). The spread of Hutton's conceptions was greatly assisted

by the luminous exposition they received from his disciple and friend Playfair, and the experimental researches of James Hall. At a later date Charles Lyell did much to bring the new views into general favor. Uniformitarianism was now triumphant: the present was recognized as the key to the past; the necessity for adopting explanations which were in accordance with the processes we see going on around us was universally admitted. When Charles Darwin—who had been much influenced by Lyell—showed that no external interference with the regular course of nature was required to explain the origin of species and the successive changes in the living inhabitants of the globe, the foundations of modern geology were at last securely laid. The greatest service done to the science was the foundation (1790) of stratigraphical geology by William Smith, an English land surveyor, who was the first to grasp the great importance of fossils as indicating the age of the beds in which they occurred. He recognized also the constant succession of new forms of life, and the possibility of identifying contemporaneous deposits in widely distant areas by means of their organic remains. Subsequently he drew up a geological map showing all the formations from the Carboniferous onwards, and his work has stood the test of time with little modification.

The main subdivisions of the geological record as accepted at the present day for North America are as follows:

		Pleistocene or Recent.
Tertiary or Cenozoic.	{	Pliocene.
		Miocene.
		Eocene and Oligocene.
Secondary or Mesozoic.	{	Cretaceous.
		Jurassic.
		Triassic.
		Permian.
Primary or Palæozoic.	{	Carboniferous.
		Devonian.
		Silurian.
		Ordovician.
		Cambrian.
Proterozoic.	{	Keweenawan.
		Animikean.
		Huronian.
Archeozoic.		Archean Complex.

It has been estimated that the whole thickness of the stratified sedimentary rocks in their normal development amounts to about 30,000 ft., and that the time required for its accumulation is about ninety millions of years. The

problems furnished by the highly folded, contorted, and intensely crystalline rocks which compose the principal mountain chains have given rise to many ingenious speculations. By using the microscope the geologist has been enabled to make deeper researches into the structure and composition of all classes of rocks. Even the minutest mineral grains can be determined, and the whole manner in which the rock is built up can be ascertained. A vast number of new names, new ideas, and new classifications have resulted, and petrology is now one of the most progressive of all the departments of geology. Consult Benson *Story of Geology* (1927); R. H. Rastall *Physico-chemical Geology* (1927); H. Ries *Economic Geology* (1930); W. A. Tarr *Introductory Economic Geology* (1930), and other standard works.

**Geometers** (*Geometridæ*), a family of moths of which the adults are in some cases known as carpet moths, while the caterpillars are known as loopers, inch-worms, measuring-worms, or geometers. The Geometridæ are remarkable in that the caterpillars are elongated and slender, and have only one pair of abdominal prolegs, placed in the posterior region in addition to the anal claspers. In consequence they progress by a 'looping' movement. Examples are the canker-worm moths and the currant moth or magpie moth.

**Geometrical Mean** of two numbers is the square root of their products. Thus, if  $g$  is the geometrical mean of the numbers  $m$  and  $n$ ,  $g^2 = mn$ . Otherwise  $m:g = g:n$ ; so that if  $g = rn$ , we have  $m = rg = r^2n$ . And hence we see that the second of any three consecutive terms of a geometrical progression is the geometrical mean of the first and third terms.

**Geometrical Progression** is the name of a series of terms each one of which is derived from the preceding term of multiplication by a definite factor;  $1+2+4+8+\text{etc.}$ , and  $1+\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\text{etc.}$ , are simple examples. In the former case the sum increases indefinitely with the number of terms; in the latter case it can never exceed two, however many terms be taken. These are respectively divergent and convergent series.

**Geometry** is the deductive science which treats of the properties of various kinds of space—linear, planar, two-dimensional, three-dimensional, and so on. The branch of geometry which first took definite shape was plane geometry. With the development of astronomy spherical geometry became necessary, and with it solid geometry, or geometry of three dimensions. The geometry of what we

believe to be the three-dimensional space occupied by the visible universe includes those just indicated, and is usually distinguished as Euclidian geometry, or the geometry of Euclidian space, since it is the geometry which is deduced from the fundamental axioms, postulates, and definitions laid down by Euclid in his *Elements*. Within the last half-century, however, non-Euclidian geometries, or geometries of space whose properties do not satisfy all the axioms and postulates assumed by Euclid, have been developed.

Euclid's classic *Elements* have long been the recognized standard, but now they are being superseded by other methods. In the modern treatment of plane geometry, geometrical drawing and the testing by measurement and calculation of the theorems proved are introduced as valuable aids, and the sequence of propositions is arranged according to the following broad divisions:—Angles and their measurement, leading up to the simpler properties of triangles; parallels and parallelograms; the various properties of the circle; the notion of ratio and proportion, and the treatment of similar figures; areas; loci and analysis of problems. This practically goes over the ground of the six books of Euclid's *Elements*. Ratio and proportion form the subject-matter of Book v.

The distinction between plane and solid geometry is not fundamental. The former is naturally studied first, because of the possibility of drawing completely representative figures. The effective study of solid geometry, at least in Euclidian form, is very difficult without the use of models. With the exception of the geometry of the sphere, the right cone, and cylinder, with their sections, and of the regular solids, the cube, tetrahedron, polyhedron, etc., little real progress was made by the ancient geometers. It is almost necessary, indeed, to have recourse to the analytical methods of co-ordinate geometry before any substantial advance is possible in geometry of three dimensions. There is, however, an important modern development of synthetic geometry, known as projective geometry, in which the elements or constituents are the point, the straight line, and the plane. Co-ordinate or Analytical Geometry is a method of singular power and symmetry. The principle of the method is explained under CO-ORDINATES. One important branch of it is called Cartesian geometry (after Descartes, the discoverer of the method). It is essentially a method of projection, the properties of curves and surfaces being studied by means of their

projections on definite lines or planes, or their sections by definite lines or planes.

The Cartesian method leads to a systematic classification of curves and surface according to the order of the equation which represents it. The method has also a close relation to the algebraic theory of functions of two or three variables, the analytical theory being greatly aided by illustrations from the geometric property of curves or surfaces, of which the functional expression may be taken as the equation. Although the most useful system of analytical geometry is the Cartesian, with its fixed axes of reference, there are other systems having special advantages for certain types of problems. Such are the polar co-ordinates, which are of particular service in astronomy. It is found to be more convenient to fix a planet's position by means of its distance from the sun, and the two angles which determine the position of the radius vector, than to use the *xyz* co-ordinates. Also, a system of special value in plane geometry is the method of trilinear co-ordinates. Non-Euclidian Geometry, or the geometry of non-Euclidian space, is based upon the recognition that certain properties of space, regarded by the early geometers as self-evident truths, are, strictly speaking, the results of experience and are not necessarily essential. Consult Low *Practical Geometry and Graphics* (1912); Tracy *Descriptive Geometry* (1914); Hatton *Principles of Projective Geometry* (1914).

**Geomorphology** describes and explains the forms into which the outer part of the earth's solid crust can be subdivided. For the geologist the structure, for the geographer the superficial configuration, is the most important. Igneous rocks are usually found in masses, and form mass lands. They may be flat, like the lava flows of Iceland and Hawaii and the trap-covered areas of the Snake-Columbia River basin of North America and the north-west of the Deccan—volcanic table lands or trap lands; or they may form a number of cones or domes rising above the surface, as in the *puys* of Auvergne—cone or dome land. Sedimentary rocks lie either horizontally, or are fractured, bent, or folded, forming flat lands, fractured lands, bent or flexure lands, fold lands. But surface forms are not only a function of the internal structure; they are also a function of the forces which have modelled them. We have to distinguish between weathering, due to changes of temperature, the gradual crumbling away and accumulation of rock waste under the action of the weather; mechanical erosion, by moving air or air and

rock waste; mechanical erosion, by moving ice or ice and rock waste; mechanical erosion, by moving water or water and rock waste; chemical erosion, by water and substances dissolved in water.

Professor Penck and others have suggested a classification of land forms according to their superficial contours. Where the land surface is approximately flat it forms a plain. Where the land rises on all sides to a maximum point—the summit—it forms a mount; and we may distinguish between a peak, where the upper slopes are steep, or a dome, where they are gentle. Where the land rises to a maximum line—the crest—it forms a ridge, which, if very rounded near the crest, is known as a hog's-back; and if the two slopes are very dissimilar, one steep, the other gentle, it forms a scarped ridge, which Professor W. M. Davis calls a *cuesta* if one slope is a dip slope. Where the land rises to a maximum surface or plain, a table is formed, called *mesa* in some parts of America. If the slope bounding it is perpendicular, it is called a cliff. When a steep slope is nearly perpendicular to the dip of the rocks, it is called an escarpment, or simply a scarp. Where the land falls on all sides to a minimum point, it is called a hollow. Where the land falls to a minimum line, it is called a furrow or trough. If this minimum line has itself a steady slope in one direction, the furrow forms a valley. Where the land falls to a minimum surface, it forms a depression. Where the land rises on two opposite sides, but falls on the two opposite sides at right angles to the first two, it forms a *col* or pass. A *col* is the maximum point of two valleys, the minimum point of two ridges. Where space is completely or almost completely surrounded by the land, it is called a cavern. Similar forms existing under the ocean may be distinguished as submarine.

**George, Fort,** a former fort on the site of Niagara, Ontario, Canada. On May 27, 1813, during the War of 1812, it was captured by a small American force under the immediate command of Col. Winfield Scott and Com. O. H. Perry.

**George, St.** (d. 303), patron saint of England, Aragon, and Portugal, stated to have sprung from Cappadocia. George was driven by the anti-Christian policy of Diocletian to a confession of faith before the emperor, which led to his torture and death at Nicomedia on April 23, 303. This day is observed in his honor by the Roman Catholic Church.

**George I.** (1660-1727), king of Great Britain and Ireland (1714-27). During George's

reign, cabinet government was developed and George showed himself alive to his responsibilities. See Thackeray's *The Four Georges* (1860).

**George II.** (1683-1760), king of Great Britain and Ireland, son of George I., was born at Hanover. Successive Whig governments conducted to the firm establishment of the Hanoverian dynasty on the English throne; and in the Seven Years' War, which was protracted into the ensuing reign, the ability of Pitt and the skill of English generals and admirals, led to a vigorous assertion of British power and the establishment of England's colonial supremacy on the ruins of the colonial power of France. Clive triumphed in India, and Canada was conquered. See Ward's *Great Britain and Hanover* (1809); Lucas *George II. and his Ministers* (1910).

**George III.** (1738-1820), king of Great Britain and Ireland, the son of Frederick Louis (d. 1751). His reign was throughout adorned by writers of great literary talent, such as 'Junius,' Gibbon, Johnson, Cowper, Scott, Byron, Coleridge, Wordsworth, Southey, Shelley, and Keats. In 1763 England, by the Peace of Paris, acquired Canada from France and Florida from Spain. In 1775 war broke out with the American colonies, and in 1776 the Declaration of Independence was issued. In 1778 and 1779 France and Spain aided the colonists; England for a time lost the command of the sea; and in 1783 the independence of the American colonies was recognized. In 1788 Pitt formed his famous Triple Alliance, between England, Prussia, and Holland, to secure peace in Europe, and in 1789 the French revolution broke out. The contest with Napoleon, renewed in 1803 and ending at Waterloo, in 1815 taxed all England's energies, but George III. was supported by the nation though it suffered heavily. Pitt returned to power in 1804 and on his death in 1806 was succeeded by the ministry of 'All the Talents', which came into conflict with the king over the question of Catholic concessions and was consequently replaced in 1807. The overthrow of the 'All the Talents' ministry was the last incident of political importance in the career of George III. George III. was not eminently wise as a king, but he was hard-working and disinterested, and he had the courage of his convictions. Unlike his predecessors, he prided himself on being English, and this, coupled with his exemplary domestic life, helped him to retain the esteem of his subjects. Consult Walpole's *Memoirs of the Reign of George III.*, Willson's *George*

III., and histories by Lecky and Stanhope.

**George IV.** (1762-1830), king of Great Britain and Ireland, the eldest son of George III., was born in London. During his reign George IV. left the reins of government in the hands of his ministers, and the progress which had set in on the conclusion of the French war was continued. Largely through Canning's foreign policy, Great Britain assumed a commanding position on the Continent, the Holy Alliance being checked, and the Greeks supported in their struggle for independence. Consult Justin MacCarthy's *The Four Georges*; Thackeray's *The Four Georges*.

**George V.** (1865-1936), king of Great Britain and Ireland, was born at Marlborough House, London, second son of King Edward VII.

Upon the death of his father, Edward VII., on May 6, 1910, he succeeded to the throne, with the title of George V., and on June 22, 1911, the coronation ceremonies took place. In the same year he made the first visit ever made by a British monarch to his overseas dominions, when he visited India and was in person proclaimed Emperor of India at the Delhi Durbar (Dec. 12, 1911). His reign was an eventful one, marked by extension of the franchise, four years of war in which the British Empire mobilized some 7,500,000 men, and prolonged discussion of the Irish question. His 25-year jubilee was observed in 1935. King George and Queen Mary had six children: Edward Albert, Prince of Wales (1894) (became Edward VIII); Albert Frederick, Duke of York (1895) (became George VI); Victoria Alexandra, or 'Princess Mary' (1897); Henry William, Duke of Gloucester (1900); George Edward, Duke of Kent (1902); John Charles (1905-19). In July, 1917, the family name of the king was changed, by royal proclamation, to Windsor. Consult *King George V.* by Sir George Arthur (1929).

**George VI.** (1895- ), king of Great Britain and Ireland and of the British Dominions beyond the Seas, and Emperor of India, second son of George V, was born Dec. 14, 1895. His title was H. R. H. Prince Albert Frederick, Duke of York. On April 7, 1923 he married in Westminster Abbey, Lady Elizabeth Bowes-Lyon, daughter of the Earl of Strathmore and Kinghorne. On the abdication of Edward VIII, Dec. 11, 1936, the Duke became King, with the title of George VI; and his wife became Queen Elizabeth. The coronation took place May 12, 1937. King George and Queen Elizabeth have two

children: Princess Elizabeth Alexandra Mary of York, born April 21, 1926; and Princess Margaret Rose of York, born Aug. 21, 1930. George VI was the first reigning British sovereign ever to be on the western continent. In May-June 1939, he and Queen Elizabeth toured Canada from the Atlantic to the Pacific, visited Washington as guests of the United States and called at the New York World's Fair. Both countries welcomed them with great enthusiasm and popular acclaim.

**George I.** (1845-1913), king of Greece, second son of Christian IX. of Denmark, ascended the Greek throne 1863. Venizelos, the Cretan leader, was a firm supporter of King George, and together they worked for the establishment of the Balkan League and the successful prosecution of the First Balkan War. (See BALKAN WARS.)

**George V.** (1819-78), last of the kings of Hanover, was the son of Ernest Augustus, Duke of Cumberland, whose father was George III. of England. He lost his sight in boyhood and was totally blind when he became king in 1851. He allied himself with Austria in the latter's struggle with Prussia and lost his kingdom, which was formally annexed by Prussia in 1866.

**George, Frederick Augustus** (1834-1904), King of Saxony, was the youngest son of King John of Saxony, and succeeded his brother King Albert on the throne in 1902. He distinguished himself as commander-in-chief of the Saxon Army Corps in the Franco-German War, and was created a Prussian field marshal by William I.

**George, Grace** (1880- ), actress, born in New York. She made her début in 1894. The plays in which she has taken a leading part include *Her Majesty* (1900); *School for Scandal* (1910); *Major Barbara* (1916); *The Road to Rome*.

**George, Henry** (1839-97), American economist and social reformer, was born in Philadelphia. Among his books are *Social Problems* (1883); *Protection or Free Trade?* (1885); *A Perplexed Philosopher* (1892); *The Science of Political Economy* (published posthumously, 1898). All of his works are written with great lucidity of thought; but the only one which attained a great measure of popularity was *Progress and Poverty*. This book placed him in the front rank of modern radical thinkers. Associates were founded in various countries for propagating the views contained therein; and several of the most gifted young men of the United States became enthusiastic exponents and followers of his

doctrines. Of foreign disciples, the most famous was Count Leo Tolstoy. The principle of taxation of land values and exemption of improvements has been adopted in New Zealand, Queensland, and most of New South Wales, while it finds prominent advocates in England and the United States. Indirectly Henry George exerted great influence on the public attitude toward the disposition by cities of valuable franchises—his denunciations of the 'unearned increment' serving to call public attention to the enormous franchise values formerly conferred gratuitously upon public service corporations. For a criticism of his doctrines, see **SINGLE TAX**.



Henry George.

An excellent biography of Henry George has been published by his son, Henry George, Jr. This is included in the *Complete Works*, published in ten volumes (1906-11). Consult also Rivaud's *Henry George et la Physiocratie* (1906).

**George, Stefan** (1868-1933), German writer, was born in Rhenish Hesse. He was Germany's outstanding poet of the neo-classical school. Among his writings are *Der Krieg* (1917); *Drei Gesänge* (1921).

**George, William Reuben** (1866-1936), Am. sociologist and philanthropist, was born in

West Dryden, N. Y. The condition of the neglected boys and girls of the city excited his sympathy, and prompted his study of the problems thus presented. This led in 1895 to the establishment of the George Junior Republic at Freeville, N. Y. He is general director of the National Association of Junior Republics. He has written *The Junior Republic* (1910); *Citizens Made and Remade* (with Lyman B. Stowe, 1912).

**George Junior Republic**, a method and institution for the training of neglected children in habits of self-respect and self-government, using as means to that end the forms of a miniature republic, modelled upon that of the United States. There are Junior Republics in several States, the oldest and most noted one being situated at Freeville, N. Y. A National Association of Junior Republics was formed in 1908, with William R. George as general director. Consult George Junior Republic Association's *Nothing Without Labor*; George's *Junior Republic* (1910); Wade's *Wonder Workers* (1912).

**George, Lake**, a body of water in Warren, Washington, and Essex counties, New York. The surrounding mountains, the eastern foothills of the Adirondacks, attain a height of over 2,000 feet. The beauty of the scenery has made the lake a summer resort. Lake George, first called Lac Saint Sacrement by its discoverer, the Jesuit Father Jogues (1642), was renamed in 1775 in honor of King George III. The famous Battle of Lake George (1755) is commemorated by a monument in the Fort George Battle Park, a State reservation. The lake is sometimes called **HORICON**, the name given to it by Fenimore Cooper. Consult Scelye's *Lake George in History*; Stoddart's *Lake George and Lake Champlain*; Reid's *Lake George and Lake Champlain* (1910).

**Georges, Marguerite Joséphine Weymar**, known as **Mlle. Georges** (1786-1867), French actress, was born in Bayeux. She became chief interpreter of the new romantic drama in Paris. Her most successful rôles were those of Clytæmnestra, Dido, Semiramis, Joan of Arc, Lucretia Borgia, and Mary Tudor.

**George's Channel**. See **St. George's Channel**.

**Georgetown**, or **Demerara** (Dutch Sta broek), port of entry, town and episcopal see, capital of British Guiana. It is the seat of Queens College; p. 57,921.

**Georgetown**, town, Kentucky. It is the seat of Georgetown College (Baptist); p. 4,420.

**Georgetown**, town, Texas. It is the seat of Southwestern University; p. 3,682.

**Georgetown**, part of the city of Washington, D. C., at the head of navigation on the Potomac River, above Rock Creek. It is the seat of Georgetown University and of the Convent of the Visitation. See WASHINGTON.

**Georgetown College**, a coeducational institution in Georgetown, Ky., opened in 1829 under Baptist auspices.

**Georgetown University**, an institution of higher learning for men, situated in Washington, D. C. It is the oldest Catholic college in the United States, having been founded by Roman Catholic clergymen in 1789. Students were first received in 1791, and the management was transferred in 1805 to the Society of Jesus, under whose control it still remains.

**George Washington University**, a non-sectarian, co-educational institution in Washington, D. C., founded in 1821 as Columbian College, by which name it was known until 1873, when it was incorporated as Columbian University. In 1904 the name was changed to George Washington University.

In 1930, a plan of academic organization was effected, 'resembling in principle the master-apprentice relation of the old guild system.'

**Georgia** (named for George II. of England, popularly known as the 'Empire State of the South' and the 'Cracker State'), a Southern State of the United States, and one of the original thirteen States. The total area is 59,265 sq. m., of which 540 are water surface.

**Topography.**—There are three topographic divisions in Georgia—the Appalachian Mountains in the northwest, the Piedmont Plateau of the north-central region, and the Coastal Plain of the south and southeastern portion. The Blue Ridge escarpment terminates in Georgia, with elevations of 3,000 to 5,000 ft. —Sitting Bull Mountain (5,046 ft.) being the highest point in the State. The most important river is the Savannah, flowing along the boundary line between Georgia and South Carolina. The climate of Georgia, though temperate, exhibits an unusual range, inasmuch as the mean annual temperature varies from less than 40° F., for some mountainous parts of the northwest, to 75° for the Coastal Plain on the southeast. Three geologic regions in Georgia correspond to the three topographic divisions. The northwestern mountainous belt consists of closely folded sandstones and limestones of Palæozoic age. The Plateau region is of crystalline rocks, granites,

and gneisses, as far south as Augusta, Macon and Columbus. The Coastal Plain represents Cretaceous and Tertiary sands, marls, clays, and limestones that dip gently toward the sea. Georgia ranks high among the States in the output of manganese and fuller's earth and in the production of barytes and bauxite. Before the California gold rush, Georgia was the chief source of gold in the United States and the mint was at Dahlonega within the State. Georgia has a very fertile soil, capable of the highest development, and farming is the most important industry. Cotton is the leading crop, nearly all counties having lands in cotton. The principal crops, with acreage, yield and value annually average as follows: cotton, 2,064,000 acres, 857,000 bales, \$37,-280,000; corn, 4,623,000 acres, 53,164,000 bushels, \$29,772,000. Georgia has been one of the leading and most progressive industrial States in the South. Georgia is traversed by the important railway systems of the South, from which numerous feeders afford access to all parts. In 1941 there were 6,000 m. of railway. The chief institutions of higher learning are the University of Georgia, at Athens; and Georgia School of Technology, both public. The State also maintains two junior colleges, the Medical College of Georgia, the North Georgia Agricultural College at Dahlonega, and the Georgia State College for Women at Milledgeville. Emory University is an important private institution. The present constitution of Georgia was adopted in 1877. The executive officials are Governor, Secretary of State, Controller-General, and Treasurer—all elected for two years. The legislature, termed the General Assembly, consists of a Senate of 52 members and a House of Representatives of 205 members. Members of each house are elected for two years. A Spanish expedition under De Soto traversed the region in 1540. It was part of the tract of land granted to the lords, proprietors of Carolina in 1663 and 1665. In 1719 it received a provincial charter, and in 1732 was made an independent colony. This last charter was obtained by James Oglethorpe, an English soldier and member of Parliament. It was his idea to found a colony as a refuge for the poor debtor classes in England and for persecuted Protestants. In February, 1733, he bought a large tract of land from the Creek Indians; chose Savannah as the seat of his enterprise; and established a colony of one hundred and twenty, taken largely from English debt prisoners. Georgia was put under a provincial government (1752). In 1763 the land lying



between the Altamaha and St. Mary's Rivers was annexed to the province. Until the Revolution Georgia prospered greatly. During the Revolution Georgia joined the cause of her sister colonies. In Jan. 2, 1788 she ratified the Constitution. A serious conflict between the State and the Federal Government over the disposition of the lands occupied by the Cherokees was settled in 1838 by the removal of that tribe to Indian Territory, and the ceding of their lands to Georgia.

In January, 1861, a State convention voted in favor of secession, and in March the State unanimously ratified the Confederate constitution. In May, 1864, Gen. William T. Sherman began his famous march to the sea, during the course of which he passed through the central part of Georgia. In February, 1870, the legislature assented to all the requirements of the Federal Government, and in July an act providing for the readmission of the State was approved by the President. See RECONSTRUCTION. Since the Civil War Georgia's history has been one of material progress and educational and social reform. In 1931 drastic measures had to be adopted to reform finance and relieve the tax burden. The number of departments, boards and bureaus was reduced from 102 to 18. In national politics the State has been Democratic except in 1840 and 1848, when the Whigs were successful; p. 3,123,723.

**Bibliography.**—Consult Harper's *Natural Resources of Georgia* (1930); Thornton's *Constitution of the State of Georgia* (1929); *Georgia's Official Register* (Annual) and other publications of the Georgia Archives and History Department; Rutherford's *Georgia* (1926); *Finding List of Books and Pamphlets relating to Georgia* (1928).

**Georgia**, since 1922 one of the three Transcaucasian Socialist Federal Soviet Republics (T. S. F. S. R.), within which are included the Autonomous Region of South Ossetia, the Aut. Soc. Republic of Adjara, and the Soviet Socialist Republic of Abkhazia. Georgia proper is divided into 16 administrative districts, and occupies a territory of 26,380 sq. m. A large area is covered by the branches of the Caucasian mountain ranges, among which are numerous valleys and plains. A subtropical climate prevails in West Georgia, Adjara and Abkhazia, and dry continental climate in East Georgia and South Ossetia. The principal rivers are the Kura, the Terek, the Chorokh, Rion, the Ingur, all flowing into the Black Sea.

Georgia has a population of 2,883,200, of

whom 1,700,000 are Georgians, and the remainder Armenians, Turks, Ossetians, Abkhazians and Russians. It is essentially an agricultural country, densely populated and suffering from insufficient irrigation. The World War brought about a shrinkage of the area under cultivation, but it has since been almost restored. In 1922 an extensive irrigation system was inaugurated to increase the fertility of the soil, especially in the dry eastern sections. Large tracts are engaged in horticulture, vine-growing, tobacco and tea cultivation. Bee-keeping and silk production, occupations of the peasants for centuries, flourish vigorously. The cocoons are exported to Russia and Western Europe. The mineral resources of the country include extensive deposits of manganese, coal and petroleum; also naphtha, copper ore, lead, iron ore, pyrites, sulphur, zinc and antimony in large quantities. There are numerous mineral and medicinal springs, the number of which is still unestablished. More than 75 springs are known. The industries of Georgia are still in the primitive handicraft stage, the peasantry of Georgian stock being for the most part engaged in agriculture and stock raising. The true Georgians are divided into tribes, each with customs peculiar to itself, and some with a distinct language. The chief towns are Tiflis (the capital), Batumi, Kutais, Sukhumi, Poti and Sochi. Education is provided by elementary schools, which are free and attendance is compulsory; preparatory schools; and colleges. The University of Tiflis was founded in 1918. Christianity was introduced into Georgia in the first century.

**History.**—Georgia was in ancient times called Iberia, and was under the rule of petty chieftains. In the Middle Ages the Kingdom received the name of Georgia or Gruzia, but the Georgians called themselves Kartli, in remembrance of Kartlos, the legendary founder of their race.

Conquered by Alexander the Great, it was only at his death in 323 B.C. that the kingdom regained its independence. Under the Bagratid dynasty (570-1801) the kingdom was extended and reached from the Black to the Caspian Sea. During the reign of Queen Tamara, who ascended the throne in 1184, Georgia reached the height of its power. In 1783 a treaty was concluded with Catherine II. of Russia, which provided for Georgian autonomy under Russian protection. In 1802 Georgia was annexed to the Russian Empire.

During the nineteenth century the country was successively deprived of its independent

courts, Georgian officials, language, national land, exemption from Russian military service, and independent church. While Russia was occupied with the Japanese war, the people of Guria province ignored the Russian officials and organized their own government. National feeling was thus revived and there began a long series of uprisings. With the establishment of the Bolshevik régime in Russia, Georgia broke away and, with the Tartars and Armenians, formed the Transcaucasian Republic of which Tiflis, the capital of Georgia, became the center. Subsequent events forced Georgia to form a separate state, and on May 26, 1918, the National Council, the representative body, proclaimed in Tiflis the Republic of Georgia. On March 12, 1919, the Act of Independence was ratified by the Constituent Assembly, and on Jan. 27, 1921, the government received *de jure* recognition by the Allies. In February, 1921, however, a Soviet government was set up. The railway system of the Republic extends to approximately 570 miles. The Military Georgian Road, about 135 miles long, cuts through the central part of the Caucasian range of mountains in a straight southern direction. It is served by motor buses. Adjara is the only district in the Union of Soviet Republics which can grow citrus fruits successfully, it having a climate similar to the western part of the Mediterranean. In April, 1932, an edict went forth from Moscow that Adjara must specialize in citrus products and abandon whatever can be grown elsewhere in the Union. Under another extravagant plan, the Russian Soviet government hopes to increase the production of tea up to 100,000,000 pounds annually, and has selected Georgia as the district for the intensive development of this crop. Tea laboratories have been established at Tiflis and a scientific tea institute created to organize nurseries, test soils and make a study of the kinds of plants which give the best yield at different altitudes and offer the most resistance to frost. The Georgian language, long in disuse save as the common tongue of the peasants, has been revived, and declared the official language. The earliest specimens of Georgian literature are translations of the Scriptures and theological works. The most flourishing period of literature was the reign of Tamara (1184-1212), when Rostaveli wrote *The Man in the Panther's Skin*. Shavteli enjoyed a still greater reputation. Toward the end of the 17th century, Prince Sulkhan Orbeliani wrote his *Journey Through Europe*. Of more recent writers, the princes Ilia Chav-

chavadze, Ivan Machabeh and Tseretheli deserve mention. Shakespeare was translated by Kiphiani. The Georgian upper class preserves its literary character, the theatre flourishes, and there are several noteworthy poets, novelists, and translators. See CAUCASUS. Consult Von Thielmann's *Journey in the Caucasus* (Eng. trans.); Wardrop's *The Kingdom of Georgia*; Villari's *Fire and Sword in the Caucasus* (1906); Baddeley's *Russian Conquest of the Caucasus* (1909); Buxton's *Trans-Caucasia* (1926); Luke's *Anatolica* (1924).

**Georgia, Strait of**, separates Vancouver Island from the mainland of British Columbia, Canada, and Washington State. It is connected with the Pacific by Queen Charlotte Sound to the north, and Juan de Fuca Strait to the south. Length, 250 miles; breadth, averaging 25 miles. It receives the Fraser River. South of the 49th parallel the middle of the strait marks the Anglo-American boundary (Treaty of 1846).

**Georgia, University of**, an undenominational institution for men at Athens, Ga., chartered in 1785 and opened in 1801. The departments at Athens are Franklin College (1801), the Georgia State College of Agriculture and Mechanic Arts (including the Science and Engineering Department and the College of Agriculture, established in 1906), Graduate School, Law Department (1903), Summer School (1904), and School of Education (1908). In addition, the Georgia School of Technology at Atlanta, the State Normal School, near Athens, the Georgia Industrial College, near Savannah, the North Georgia Agricultural College, the Medical College of Georgia, in Augusta, the Georgia Normal and Industrial College for Girls, near Milledgeville, and several preparatory institutions are organized as branches.

**Georgian Bay**, the n.e. division of Lake Huron, in Ontario, Canada. It is about 120 m. long by 50 m. wide. A peninsular extension of the province of Ontario (Saugreen) and Great Manitoulin Island partly cut it off from the main body of the lake. It contains numerous islands.

**Geotropism**, the sensitiveness of plant organs to the action of gravity, which leads them to bend back, if displaced, until they again point in their natural direction. Positive geotropism is illustrated by the tendency of roots to grow downward toward the center of the earth, the sensitive part being apparently the root tips. Negative geotropism is shown in the upward tendency of growing stems. The processes in the plant by which the pheno-

mena of geotropism are effected remain to a large extent unknown. They are thought to be connected with changes of position of the movable starch grains present in the cells. Growth in any given direction may be the resultant of geotropism, heliotropism, and other forces.

**Gepidæ**, an ancient people, first known in history as settled near the southeastern shore of the Baltic. In the third century they made inroads into Mœsia and Thrace. In the fifth century, with the Vandals and Burgundians, they moved into Italy, but were defeated in 406 by Stilicho. They were conquered by Attila; but on his death (453) they occupied Hungary and Transylvania. It was to check their power that Justinian invited the Lombards to occupy the Roman provinces between the Danube and the Alps. Conquered by the Lombards and Avars, the Gepidæ were gradually extirpated, and their lands seized by the Avars.

**Gerald, Paul** (1885- ), French poet and playwright. He wrote *Le Grand-père*, a poem about Joffre and the World War, popular poems collected under the title *Toi et Moi*, and several plays which have been produced by the comédie Française, among them *Robert et Marianne* (1926).

**Geraint**, a knight in the Arthurian legends, who appears in the *Mabinogion* as *Geraint the son of Erbin*. See Tennyson's *Geraint and Enid*.

**Geranium**, a family of more or less aromatic plants and its most important genus. The family (Geraniaceæ) contains 11 general and 475 species, common in temperate regions, and particularly in South Africa. The genus *Geranium* includes about 275 species in the United States and Europe. The wild geranium, or 'crane's bill,' of the United States is *G. Maculatum*, one of the common, early blooming flowers, with rounded, deeply cleft leaves, and numerous large, magenta pink flowers. The widely distributed herb, Robert (*G. robertianum*), is a rank-odored plant, common on rocks, where its soft, compound, fern-like leaves and pink little flowers are very attractive. An Alaskan species (*Gerianthum*) bears very large flowers. Garden geraniums belong to the genus *Pelargonium*, differing from the genus *Geranium* in the irregularity of the corolla.

**Gérard, Conrad Alexandre** (1729-90), French statesman. While secretary to the Council of State, he represented France in the negotiations with Benjamin Franklin and others that brought about the Franco-Ameri-

can Alliance (1778); and in 1778-9 he acted as the first French minister to the United States.

**Gérard, Etienne Maurice, Count** (1773-1852), French commander. He became famous by a splendid charge at Austerlitz. In Napoleon's Russian expedition he rendered great service to France; as also in the campaign of 1814. In 1831-32 he expelled the Dutch army from Flanders, and forced Antwerp to surrender.

**Gérard, François Pascal, Baron** (1770-1837), French painter, was born in Rome. He studied at Paris under David. A portrait of Madame Bonaparte (1709), followed by portraits of Madame Récamier, Madame de Staël, Napoleon, Talleyrand, and others, placed him in the foremost rank of contemporary portrait painters.

**Gerard, James Watson** (1867- ), American lawyer and diplomat, born at Genesee, N. Y. He studied at Columbia and the New York Law School, and began law practise in New York City in 1892. He was chairman for four years of the Democratic campaign committee of N. Y. county, and was elected associate justice of the Supreme Court of New York in 1908, an office which he resigned in July, 1913, on his appointment as ambassador to Germany. Upon the breaking off of diplomatic relations with Germany, he was recalled and retired that year from diplomatic service. He was chairman of the Democratic National Committee up to 1932, and chairman of the Finance Committee from 1934. The two books on his foreign experiences are *My Four Years in Germany*, 1917, and *Face to Face with Kaiserism*, 1918.

**Gerardia**, a genus of plants belonging to the order Scrophulariaceæ. The species of *Gerardia* are sturdy little herbs with opposite sessile leaves, and purplish or white axillary flowers. One (*G. maritima*) is common in salt marshes, having thick linear leaves and rose-purple flowers.

**Gérard, Jean** (1877), Belgian violoncellist, born in Liège. After studying at the Brussels Conservatory and under David Popper, he appeared, when ten years old, as a concert player in Paris, Berlin, and Vienna. He has played with the Boston Orchestra, the Philharmonic Society of New York, and has made successful tours of the United States, France, England, and Germany. His first visit to the United States was in 1900, with Ysaye.

**Gerbart**, original name of Pope Sylvester II.

**Gerboa**. See *Jerboa*.

**Gerda**, in Norse mythology, the daughter of the frost-giant Gymir, and the wife of Freyr.

**Gerfalcon**. See **Jerfalcon**.

**Gerhard, Friedrich Wilhelm Eduard** (1795-1867), German archæologist. During fifteen years spent in Rome (1822-37) he carried on archæological researches, and took a prominent part in the founding of the Archæological Institute at Rome.

**Gerhardt, Karl Friedrich** (1816-56), French chemist, was born in Strassburg. He studied under Liebig at Giessen, and going to Paris, published there, in collaboration with Cahours, a memoir on essential oils, embodying new theories, which brought him into prominence. His conclusions upon the order of organic compounds mark an epoch in the history of chemistry. His *Précis de Chimie Organique* (1844-5), and especially (1853-6), comprise the results of his research. In 1855 he was appointed professor of chemistry at Strassburg. Consult Cahours' *Notice sur Charles Gerhardt*.

**Gerhardt, Paul** (1607-76), foremost German hymn writer of the seventeenth century. He wrote 123 hymns, many of which have been translated into English.

**Gericke, Wilhelm** (1845-1925), German orchestra conductor, born in Gratz, Austria, was a pupil at the Vienna Conservatory, and of Dessoff and Hans Richter. In 1865 he went to Linz, Austria, as conductor at the opera, and in 1874 to Vienna. In 1881 he succeeded George Henschel as conductor of the Boston Symphony Orchestra. Ill-health caused him to resign in 1889 and return to Vienna; but he resumed his work with the Boston Orchestra in 1898, succeeding Emil Paur, and carried it on until March, 1906.

**Germ**. See **Bacteria and Bacteriology**.

**German, Sir Edward** (1862-1936), English musical composer. In 1889 he was made musical director of the Globe Theatre; in 1893 he conducted concerts at the Crystal Palace and later, performances of his own compositions at various musical festivals. His works include incidental music to *Richard III.*, *Henry VIII.*, *Romeo and Juliet*, *As You Like It*, *Much Ado About Nothing*, and *Nell Gwyn*, which is exceedingly popular; *Just-So Book*, with Rudyard Kipling, and many orchestral works and songs. His Coronation March and Hymn were performed in Westminster Abbey at the coronation of King George V. (1911).

**German Catholics**, a body of reformers who broke away from the Church of Rome

and formed congregations at Schneidemühl and Breslau in 1844 and 1845. In March, 1845, at Leipzig, was held the First General Church Convention of German Catholics with fifteen congregations present. The title German Catholic Church was adopted, a creed was set up, and regulations concerning divine worship were made. Friendly relations soon arose between German Catholic congregations and the free Protestant congregations founded about the same time, and in 1850 they met together in Leipzig for negotiations, with the result that in 1859 the Religious Society of Free Congregations was formed.

**Germander**, a name sometimes given to plants belonging to the genus *Teucrium* (*Labiatæ*), as the Wood Sage (*T. canadense*) or American Germander. The upper lip of the corolla is very short and deeply two-cleft. See **LABIATÆ**.

**German East Africa**, of which the part held by the British is now called Tanganyika Territory, former German colony on the eastern coast of Africa, is bounded on the north by British East Africa, on the east by the Indian Ocean, on the south by Portuguese East Africa, and British Central Africa, and on the w. by the Congo Free State. The area is 365,000 sq. m.

The seacoast, 500 miles long, is low lying and monotonous, rising to hill land, which merges westward into higher and more plateau-like country, forestclad, and affording pastoral and arable land. A mountain mass 1,455 sq. m. in area, guards the northern frontier while the Livingstone Range, nearly 10,000 feet in height, follows the northern and eastern shores of Lake Nyasa in the extreme southwest. In the west lies the hilly tableland of Unyamwezi. The eastern drainage includes the rivers Pangani, Wami, Kingani, Rufiji, Umbekuru, and Rovuma. The western drainage includes the Simiyu and Kagera, emptying into Victoria Nyanza on the northern frontier; the Malagarazi into Lake Tanganyika; the Songwe into Lake Rikwa; the Ruhuhu into Nyasa. The climate is hot and enervating on the coast, but healthful in the highlands of the interior. The rainfall varies in different parts of the colony from 21 to 74 inches.

Sisal fibre, rubber, and Egyptian cotton, introduced by German planters, are successfully grown, and coffee, which grows wild, is also cultivated on the plantations. Sorghum, maize, bananas, vanilla, tobacco, and tea are raised in the interior; manioc and sweet potatoes on the coast. Thick forests of sweet apples, tamarinds, and melons crown the highlands; on

the coast grow the mangrove, baobab, and tamarind. Mica and garnets are found in large quantities; while gold, salt, copper, iron, lead, agates, topaz, and other precious stones have been discovered. Commercially, mining is entirely undeveloped.

The chief exports are sisal fibre, rubber, copra, coffee, wax, hides and skins, ivory, groundnuts, cotton, sugar, gold, diamonds and grain. Imports include food, iron, hardware, and textiles.

Well-kept roads traverse the colony, and there are two railroads—the Usambara, from Tanga, on the coast, to New Moshi (220 m.), completed in 1912; and the Central Railway, from Dar-es-Salaam, on the coast, to Kigoma, on Lake Tanganyika (780 m.), completed in 1914. Wireless telegraph stations have been erected at Dar-es-Salaam, Muanza, and Bukoba. The population is mostly Bantu; along the coast are Arabs, Baluchis, Indians, Goanese, Syrians, and Swahilis. The Swahili tongue is the *lingua franca* of East Central Africa. The native population is estimated at about 4,794,000, while Europeans numbered about 6,600.

At the beginning of the sixteenth century the Portuguese began to reduce the coast towns. In 1884, Dr. Peters, the German emissary, claimed treaty rights over Uzegeha, Ukami, Usagara, and Uguru—rights straightway clinched (1885) by imperial protection. The present boundaries were successively determined by agreement with the Congo Free State, with Portugal, and with Great Britain. In 1890, in consideration of an indemnity of \$1,000,000, the sultan of Zanzibar waived all of his sovereign rights over the mainland in favor of Germany. During the World War German East Africa offered the strongest resistance of any of the German colonies. In 1916 a Boer army under General Smuts, advancing from British East Africa, reached the railroad from Hanga to Moshi; a detached force under General Vandeventer defeated the Germans in the Arusha region, occupied Kothersheim, Salanga, Kondoa Irangi, and Kilimantinde. At the same time a British force under General Northey was advancing from Rhodesia between Lakes Nyasa and Tanganyika; another British force invaded from Uganda, while Belgian forces advanced from the Congo, and Portuguese forces attacked from the south. Dar-es-Salaam, the capital, surrendered, Sept. 4. The conquest ended in December, 1917. See EUROPE, GREAT WAR OF.

Consult Keltie's *Partition of Africa*; Brode's *British and German East Africa* (1911);

Joelson, *Tanganyika Territory* (1920) and *Eastern Africa Today* (1928); Sayers' *Handbook of Tanganyika* (1930).

**German Evangelical Protestant Church**, the name given to a number of independent churches in the United States which are connected by no constitutional organization.

**German Evangelical Synod of North America**, a religious denomination founded in 1840 at Gravois, St. Louis county, Mo., for the purpose of meeting the religious needs of German immigrants. It was later joined by other evangelical bodies and in 1872 adopted its present name. The strength of the organization, which comprises 20 districts, is greatest in the Central and North Central States. The denomination maintains Elmhurst College, Elmhurst, Ill., and Eden Theological Seminary, St. Louis, Mo.

**Germania**, a name applied in Roman times to the country bounded by the Rhine on the west and Baltic on the north, the vistula and the Carpathian Mountains on the east, and the Danube on the south. Its inhabitants are described as a people of great stature and strength, with fair complexions, blue eyes, and yellow hair. Many of their tribes were nomad; their chief occupation was war; and they were ardently attached to liberty. The Romans waged frequent wars with the German tribes. Tacitus' *Germania* is the chief ancient authority.

**Germanicus, Cæsar** (15 B.C. to 19 A.D.), Roman general, was the son of Nero Claudius Drusus and of Antonia (daughter of Mark Antony), and nephew of the Emperor Tiberius. In 14 A.D. he quelled the mutinous troops on the German frontier and in Illyricum and led them against the enemy. Crossing the Rhine below Wesel, he attacked and routed the Marsi, and next year marched to meet the redoubtable Arminius. Arminius successfully evaded an encounter on this occasion, but in the year 16 was completely overthrown by him in two desperate battles.

**Germanium** (Ge, 72.5), a metallic element of the silicon group, discovered by C. Winkler in 1885, in a silver ore called argyrodite. It is prepared by reducing the oxide obtained from argyrodite, either by charcoal or by hydrogen, and is a gray-white, brittle, crystalline, and somewhat infusible metal, that retains its lustrous appearance in air at ordinary temperatures. It is tetravalent in most of its compounds, the most important of which is the dioxide, GeO<sub>2</sub>.

**German Language, German Literature**

ture. See Germany; Language and Literature.

**German Measles.** See Measles.

**German Silver, or Nickel Silver,** an alloy of somewhat variable composition, but consisting approximately of copper 4 parts, zinc 2, and nickel 2. It forms a white, tough metal that takes a good polish, and is suitable for the manufacture of spoons, forks, and similar articles; but as it soon tarnishes, it is usually electroplated. German silver has a high electrical resistance, and is largely used for making resistance coils.

**German Southwest Africa,** prior to the World War (1914-18) a German African colony, is bounded on the North by Portuguese West Africa and North Rhodesia, on the west by the Atlantic Ocean, on the south and southeast by the Cape Province of the Union, and on the east by Bechuanaland Protectorate. Total area, 322,394 sq. m. Walvis Bay on the west coast, with 374 sq. m., has been a British possession since 1878.

Mainly a plateau, the land falls seaward in terraces, gentle slopes, or sandhills. The southern and much of the eastern parts are barren and desert.

Vegetation is particularly rich in the Cubango valley with its dwarf palms and papyrus. In Ovamboland, in the north, maize and kafir corn are grown, and in the Outjo district the cultivation of cotton and tobacco is being attempted. The chief industry is stock-raising. Considerable prospecting for minerals has been undertaken. Copper is mined fairly extensively, especially at and near Tsumem. Other minerals are vanadium, tin and marble. Diamonds, small but of good quality, were discovered in 1908 along the coast. A great nitrate of soda field extending over 10,000 sq. m. was discovered in 1929.

The chief native races are Bushmen. Hotentots, Hereros, Ovambos, bergdamaras, and bastards, numbering about 237,000. The European population is about 25,000. German occupation dates from 1884. In the World War British and Boer forces conquered the territory, 1914-1915. The country is administered by the Union of South Africa under a Mandate of the League of Nations, dated Dec. 17, 1920. In 1925 a Union parliament granted a constitution to Southwest Africa, providing for an Executive Committee, an Advisory Council and a Legislative Assembly. The seat of government is Windhoek, which with its surrounding district has a population of 4,602 Europeans and about 14,000 Natives. Consult W. Everleigh's *Southwest Africa* (1915);

P. Barth's *Südwest-Afrika* (1926); I. L. Evans' *The British in Tropical Africa* (1928).

**Germantown, Battle of,** was fought on Oct. 4, 1777, at Germantown, Pa., now a suburban section of Philadelphia, between an American force under General Washington and a British and Hessian force under Lord William Howe, the Americans being defeated. Washington, undaunted by his recent defeat (Sept. 11) at Brandywine Creek, planned to surprise Howe, whose main force was stationed approximately along the line of Old School Lane in Germantown. The attack was admirably planned. The Americans were to march in four divisions along four roads leading into Germantown; they were to get into position before daybreak on Oct. 4, and after a short rest to deliver their attack. The main division was delayed at the old Chew House, in which Colonel Musgrove with a small British force had taken shelter; a heavy fog made marching difficult; Wayne's troops (of the center) and Stephen's (of the left) mistook one another for the enemy; and finally the Americans were driven back by the British. See REVOLUTION, AMERICAN.

**Germany,** still called the German Reich, though now a totalitarian state and no longer an empire, lies between the North Sea, Denmark, the Baltic Sea and Lithuania on the north, Poland and Hungary on the east, Hung., Yugoslavia, Ital. and Switz., on the s., and France, Belgium and Holland on the west. It comprised, prior to the 1914-18 War, the several kingdoms, grand duchies, duchies, principalities, free towns, and the Imperial Territory of Alsace-Lorraine making a total area of 208,810 sq. m., with a population (1910) of 64,903,423. By the treaty of Versailles (1919), however, following the War, Germany surrendered Alsace-Lorraine (5,600 sq. m.) to France; the districts of Malmédy and Eupen (382 sq. m.) to Belgium; parts of Silesia, Posen, West and East Prussia (17,816 sq. m.) to Poland; the Memel district (1,026 sq. m.) to Lithuania; and 122 sq. m. to Czechoslovakia. She also lost sovereignty over Danzig (754 sq. m.) and the rich Saar Valley (738 sq. m.), which became internationalized for a period lasting until 1935. (See DANZIG; SAAR VALLEY), while portions of Schleswig, East and West Prussia, and Upper Silesia, with over 6,700 sq. m., were designated as territories which were to determine later whether they wished to remain German or be incorporated with Denmark and Poland, respectively. This was done by plebiscites, which had the following results: Schleswig (March, 1920),

northern zone (1,537 sq. m.) for Denmark, southern zone for Germany; East and West Prussia (July, 1920), for Germany; Upper Silesia (March, 1921), for Germany. Despite the decision in Upper Silesia, 1,255 sq. m., with a population of 891,699, were transferred to Poland. The total area thus lost to Germany was 27,950 sq. m. with a population of 7,250,000.

The Baltic coasts are uniformly low and but little indented, save for the wide bays of Lübeck, Pomerania, and Danzig. But the great rivers (Oder, Vistula, and Memel or Niemen) which reach the Baltic along this coast have formed at their mouths extensive shallow lagoons or *Haffs*. Islands are few. Usedom and Wollin, Rügen, Fehmarn and Alsen. The coast of the North Sea is everywhere low and sandy. On the mainland the marshy strips along the seaboard and up the lower courses of the rivers (Elbe, Weser, and Ems) are probably the most fertile regions in the country. But they are backed by some of the most unfertile.

Physically, Germany is divisible into two strikingly contrasted regions—(1) the great North German plain, and (2) the mountainous and hilly region of Central and Upper Germany. The former stretches from the eastern to the western frontier. It does not, however, form a uniformly inclined plane, but is diversified by two well-marked ridges or swellings. The space between these two ridges is to a great extent occupied by the Oder-Havel-Spree depression, with numerous lakes and marshes. The North German plain is backed on the south by the Sudetic Mountains. These extend in a double line from the frontiers of Bohemia to the watershed which divides the basin of the Weser from the basin of the Ems. The most conspicuous are the Harz Mountains (2,000 to 2,800 ft.), culminating in the mist-drenched Brocken (3,745 ft.), with its wealth of weird and gloomy tradition. In this range copper, silver, and lead have been mined for ages. Farther to the southeast, in Silesia, there are a number of small ranges, irregularly grouped along the Bohemian border. These include the rich coal deposits which render Silesia one of the busiest industrial regions in the country. At their southern extremities the two divisions of the Hercynian system are connected by the picturesque sandstone hills of 'Saxon Switzerland,' and by the Erzgebirge, the latter being on the German side a high plateau region with a severe climate. This range gets its name from the mineral ores which it contains—sil-

ver, iron, tin, copper, lead, cobalt, nickel, and bismuth. Both these mountains and the Bohemian Forest range meet in the mountain-knot called the Fichtelgebirge or Fir Mountains (2,500 to 3,500 ft.). The Fichtelgebirge are connected with the Thuringian Forest, and is a scene of busy industrial activity, and shares with the Harz the attention of holiday-makers during the summer months. From the Thuringian Forest there stretches south as far as the Black Forest a broken wooded plateau, backed by the Swabian and the Franconian Jura, a long, narrow rib (2,000 to 3,000 ft.) which separates it from the Bavarian highlands on the south of the Danube. The whole of the country south of the Danube is a highland region ranging from 1,300 to 3,200 ft., is cut by deep, torrential streams and by lakes.

The Rhine Valley is shut in by the Vosges (3,000 to 4,000 ft.) in French territory, and the Black Forest or Schwarzwald (2,400 to 4,000 ft.) in Baden—both similar in structure and in general characteristics—densely wooded, in great part with conifers, and trenched by deep, picturesque valleys. They screen the Rhine Valley from chilling winds, and so secure to it a warm, sunny climate. The Hunsrück has remarkably fertile valleys which yield an abundance of wine. The Taunus range (1,600 ft.) yields the most famous wines of Germany. In the valleys and on the slopes of the range there are a great number of mineral spas—Wiesbaden, Homburg, Soden, Ems, Schwalbach, Schlangenbad, and others. The Rhine has forced a passage through the heart of this vast Devonian plateau in a narrow, tortuous bed, which is overhung with castle-crowned crags, and over which the spirit of romance has brooded for ages. On the whole, the climate of Germany is temperate, and considering the extent of the country, remarkably uniform in all its parts. Rain falls at all seasons.

*Mining.*—Coal exists in almost inexhaustible quantity in Silesia—around Beuthen and about Waldenburg. Bohemia has much coal. Another vast store is worked in the basin of the Ruhr in Westphalia, around Dortmund, Essen, Bochum, Duisburg, Hagen, and other industrial centres. A third great field in the basin of the Saar, was internationalized by the Treaty of Versailles, but is now German territory (see SAAR VALLEY). Lignite is extensively mined, the national output for 1938 being 194,964,000 metric tons, exceeding that of coal of which 186,180,000 tons were mined. Iron is mined principally in the valley of the Lahn in Hesse-Nassau, and

in the Rhine Province and Westphalia, from Bonn eastward to Siegen. The total output of iron ore in 1933 was 8,522,000 metric tons. Zinc is mined near Aachen and in Silesia. Rock salt and other mineral salts are extracted on an immense scale in the Prussian province of Saxony. The total output in 1932-33 was 2,087,000 tons of rock salt, 491,000 of brine salt, and 890,000 of potash. Copper is mined in Prussian Saxony and Westphalia; lead, with silver and gold (the last two in diminishing quantities), in the Harz and Saxony; lithographic stone in Bavaria. Amber is obtained near Königsberg.

**Forestry.**—The only part of Germany in which trees are not more or less plentiful is the northwest. About 27 per cent. of the total area of the country is covered with forest. Of this area about one-third is in state forests, one-sixth in communal forests, one-half in private forests, and the remainder the property of associations. The total forest area is 31,635,443 acres. Forestry as an industry has received much attention under state control.

**Fisheries.**—Among the fish of Germany the most generally distributed are carp, salmon, trout, and eels; the rivers contain also crayfish, pearl-bearing mussels, and leeches. The oyster, herring, and cod fisheries constitute important branches of industry on the German shores of the Baltic and North Seas.

**Agriculture and Stock Raising.**—Agriculture remains the most important industry of Germany. During the last fifteen or twenty years of the 19th century it made extraordinary progress, especially in the Prussian province of Saxony, the Mecklenburg duchies, Westphalia, and Württemberg. One potent factor in the revolution which was effected was the cultivation of beet root for sugar; other factors were a thorough study of the application and effect of chemical manures upon crops and soil, a more extensive cultivation of roots generally, stall-feeding of cattle, and the use of the best modern implements. Not only did the state foster education in the technical branches of agriculture, but it introduced breeds of live stock, granted exceptional railway freights for agricultural produce, and spent millions of money upon the construction of new canals and the improvement of the existing waterways. The agricultural university colleges at Württemberg, Berlin, Bonn, Breslau, Giessen, Göttingen, Halle, Jena, Kiel, Königsberg, Leipzig, and Munich did much. But the agency to which the German farmers more especially owe the progress they have made is co-operation among themselves. By far the great-

er portion of the German farms are small, 94.5 per cent. being less than 50 acres in extent. Small estates and peasant proprietorship prevail in the Western and Southern German states; large estates in the Northeast.

The principal cereal crops are rye, wheat, and barley. Sugar beets are grown extensively in the north; the area planted to this crop increased from less than 350,000 acres in 1883-4 to nearly six times that in 1938. What the sugar beet is to North Germany the vine is to South Germany. The best wine is produced in the valleys of the Rhine, Moselle, Main, and Neckar. The vine is also cultivated in the valleys of the Saale, Elbe, and Oder. Hops are extensively grown in Bavaria, and to a less degree in Württemberg and Baden. Tobacco is grown principally in Brandenburg and Pomerania, and in Baden, Bavaria, and Hesse.

Gardening (flower seeds, bulbs, etc.) is an important industry in the neighborhood of Erfurt, Quedlinburg, and Aschersleben in Central Germany; fruit (cherries, apples, pears) is a source of considerable income in Württemberg. Bees are a source of profit in North Germany. Germany has long been noted for the good breed of horses raised in the north; Saxony, Silesia, and Brandenburg have an equal reputation for their sheep and the fine quality of the wool which they yield; and the rich alluvial flats of Mecklenburg and Hanover are celebrated for their cattle.

**Manufactures.**—In the last two decades prior to the World War the manufacturing industry of Germany made remarkable advances, particularly chemical, electrical, fancy and semi-artistic, and ship-building lines, much of the progress which was made being due to the alert policy of the imperial and state governments. Iron and steel industries are chiefly in the Rhine Province, Westphalia, Bohemia, and Silesia. The cotton industries are conducted on the largest scale in Austria, Saxony, in the Rhine Province and Westphalia, in Silesia, Württemberg, Bavaria, Baden, and Berlin. The woolen industries centre principally in the Rhine Province, the state of Saxony, Thuringia, Brandenburg, Silesia and at Stettin, Stuttgart, and Berlin. Hosiery is made in Saxony (state), Thuringia, Bavaria, Württemberg, and Berlin. Linen manufactures are carried on principally in Posen, Pomerania, East and West Prussia, Silesia, Brandenburg, Hanover, Westphalia, and the Rhine Province. Silk and velvet goods are made in Crefeld and other places in the Rhine Province, and in Berlin and in Baden. Hemp is spun in Württemberg and Bavaria, and jute in



Brunswick, Bremen, and other towns. Bricks and earthenware are produced in Brandenburg, Pomerania, Hesse-Nassau, and Baden; porcelain and glass in Saxony (Meissen), Thuringia, Bavaria, in Berlin, and in Silesia and the Rhine Province. Cement is made in large quantities in Pomerania. Nuremberg, Hanau, Berlin, and Pforzheim are seats of the gold and silver industries. Chemical manufactures flourish in the Rhenish Palatinate, the state of Saxony, Hesse-Nassau, the Rhine Province, and Württemberg.

Brewing is carried on in all parts of the country, but is a special industry of Bavaria, as distilling is of the northern and northeastern provinces of Prussia.

*Communications.*—In 1937 there were 36,197 m. of railways open for traffic, of which 23,319 m. were privately owned, the rest being owned by the Central Government. A program was adopted in 1933 for an extensive system of automobile highways to be connected with the railways. Germany is splendidly equipped with internal waterways. The principal navigable rivers are the Rhine, Main, Elbe, Oder, Weser, Ems, the Eastern waterways, and the Danube. These are supplemented by the following engineering works of great importance: The Kaiser Wilhelm, North Sea-Baltic, or Kiel, Canal (61¼ m. long), connecting the North Sea and the Baltic, constructed in 1887-95; the Dortmund-Ems Canal (161½ m.), connecting the lower Ems with the Rhenish Westphalian coal field, in 1892-9; the Elbe-Trave Canal, from Lübeck to the Elbe (42 m.), opened in 1900; the Königsberg-Pillau Canal (24 m.), cut through the Kurisches Haff in 1893-1901; the Kaiserfahrt channel, between the Stettiner Haff and the open Baltic in 1901; and the Hohenzollern Canal between Berlin and Hohenstaaten, opened in 1914. Altogether, the internal navigable waterways of Germany reach a total of 7,653 m.

Germany has been one of the leaders in the development of commercial air traffic since the World War. In 1937, 323,000 passengers were carried over a total distance of 11,702,000 m. Postal and telegraphic services are controlled by the Central Government.

*Finance.*—The finances of Germany have been, since the close of the Great War, a matter of international concern because of the war debt, which has been the subject of many conferences and plans of settlement. At the end of 1930 the total foreign debt (public and private) was estimated at about 32,000,000,000 Reichmarks, a total reduced by 1938

to approximately 22,500,000,000. Meanwhile the subject of the payment of long-term government bonds began to engage the attention of German financiers. The government agreed to pay 50% in cash, the remainder in scrip, which in its turn was redeemable at only half its value at the Gold Discount Bank. By clever manipulation, in which this bank sold scrip to German exporters at 55% of the face value, these exporters could 'dump' their goods abroad, thus allowing the government to call in and buy up its bonds at a low price and yet to manage its foreign trade so profitably as to call back from abroad bonds worth at least two millions at par for cash payments of only a third or fourth of that sum. This plan was virtually terminated at the end of the year 1933.

*Commerce.*—Beginning with 1888 German commerce was administered by the Zollverein or Customs Union, embracing nearly all the states and Luxemburg. There were 145 commercial districts, each with a chamber of commerce, and these bodies exercised a potent influence in building up German trade. Prior to the first World War, Ger. held second place among the commercial nations of the world. Following low averages for 1929-1932, years in which Germany shared with the rest of the world in the industrial depression, we find merchandise exports, reckoned in terms of 1,000 Reichmarks, to be valued at 4,880,000 as over against 4,203,600 as the figure for imports. With vast public works projects, unemployment in Germany had been practically eliminated by 1939. The whole export-import situation is bound up with economic questions involved in methods and terms of payment of war debts.

Of the total annual exports about three-fourths were manufactured articles, while of the imports raw materials and semi-manufactured articles were about one-half, foods and beverages almost one-third, and manufactured articles almost one-fifth. Of the aggregate German trade a large proportion passes through Hamburg and Bremen, Stettin, Lübeck, Kiel, and Königsberg and also through important commercial ports of the Netherlands and Belgium.

Germany before the War ranged third in tonnage among the sea-carrying countries of the world. In 1932-33 the German merchant marine aggregated 4,164,000 gross tons; the record of shipping was of 24,000,000 gross tons entering German ports, with 20,000,000 gross tons cleared. In 1937 Germany launched a 435,000 tonnage of new merchant ships.

*Government.*—For the sake of an understanding of later conditions, a brief description of the imperial German government must be given, although the Empire as such ceased to exist after the revolutionary movements of 1918 and 1919. Under the imperial constitution (April 16, 1871), Germany was a confederation of states mostly monarchical, each with its own constitution and legislature. The imperial government centered in the Emperor or Kaiser, assisted by a Chancellor appointed by the Emperor, removable at his will, and responsible to him alone. The legislative bodies were the Bundesrat, or Federal Council, composed of delegates appointed by the several state governments, and the Reichstag, or popular assembly, consisting of 397 members elected by the voters of the Empire. The outstanding feature of the German Empire as a confederation of states was the predominance of Prussia. The king of Prussia was German Emperor, and, as such, united to his already practically absolute powers in his own state, the power, with the consent of the Bundesrat, to declare war, the chief command of the imperial army and navy, the control of the foreign affairs of the Empire, the power to convene and dissolve the Bundesrat and the Reichstag—and the appointment of all imperial officials. Prussia's predominance was further enhanced by her representation in the Bundesrat, to which she sent 17 of the 61 members, as compared with six from Bavaria, four each from Saxony and Württemberg, and from one to three from each of the other states. As the delegates of this body were representatives of the various rulers of the states rather than of the people, as each delegation voted as a unit upon the instruction of its sovereign, and as Prussia had the right in respect to military matters, customs, and taxations, to prevent any alteration by her adverse vote alone, the Emperor had thus what in practice amounted to a controlling voice.

During the closing weeks of 1918 Germany was involved in internal revolution. On Nov. 9 the Emperor abdicated and fled to the Netherlands, and a provisional government was set up headed by Friedrich Ebert, then Chancellor. A National Assembly was convened at Weimar on Feb. 6, 1919; on July 31, 1919, a new constitution was approved, and on Aug. 22 Friedrich Ebert took the oath of office as President of the German Republic. The German Empire was declared to be a republican state, with a president to be elected every seven years by popular vote, and a

National Assembly elected every four years. The Chancellor and the ministry were appointed by the President. The Constitution declared all Germans equal before the law, and abolished all privileges or disadvantages of birth, class, or creed. Freedom of speech and of press was guaranteed; so was the right of meeting. Members of the legislature of the Republic (*Reichstag*) were to be elected by universal, equal, direct and secret votes of male and female voters, on the proportional system, for 4 years.

*Army and Navy.*—Following the establishment of the Hitler government in 1933, the Reichstag so amended the Constitution of 1919 as to give the government complete power over all the functions of the state. The terms of the Treaty of Versailles (1919) required that by a date not later than March 31, 1920, the German Army be reduced to not more than seven divisions of infantry and three divisions of cavalry, the entire number of officers and men not to exceed 100,000; and the army to be devoted solely to maintaining order and controlling frontiers. The amount of armament allowed was also fixed and the manufacture of arms and munitions permitted only in approved factories. Universal compulsory military service was abolished by the Treaty and recruitment was allowed only by voluntary enlistment. By the terms of the Treaty of Versailles (1919) the German navy was limited to 8 battleships, 8 light cruisers, 32 destroyers and torpedo boats; the officers and men to 15,000. The acquisition and construction of submarines were forbidden. By 1939, Germany had a standing army of some 1,000,000 men, second in size to only that of Soviet Russia, and the German air forces were reputed to be the most powerful in the world. The German navy, 1939, counting ships under construction, was believed to include 5 battleships, 3 pocket battleships, 2 aircraft carriers, 15 cruisers, 42 destroyers, 62 torpedo boats, and 71 submarines; personnel over 50,000. About 40 submarines were sunk in the first three months of the European War, 1939.

*Population.*—The population of the Republic, by a 1933 census, reached a total of 65,306,130, 31,699,487 being men and 33,606,643 being women. By comparison with figures of the 1925 census it is evident that the excess of females resulting from the casualties of the World War is gradually diminishing. The 1936 birth rate was 19 per 1,000 inhabitants; the death rate, 11.8. The vast majority are of Teutonic blood. By 1939, after the merg-

ing of Austria, Czechoslovakia and Memel, the population was about 88,000,000.

*Religion.*—By the terms of the constitution of 1919, church and state were entirely separate. According to the census the population included 40,014,677 Evangelical (Reformed and Calvinistic) Protestants, 20,193,334 Roman Catholics, and 564,379 Jews. The Roman Catholics predominate in Posen, Silesia, Bavaria, Baden, the Rhine Province, and parts of Westphalia and West Prussia. The Old Catholics have a bishop at Bonn. The Protestants are governed by provincial consistories and by synods.

*Education* is compulsory for all children between six and fourteen years of age and is practically homogeneous throughout the country. In 1932-33 there were 52,959 public elementary schools, with 7,590,466 pupils; and 661 private schools, with 48,760 pupils. 'Middle' schools, where both English and French were taught, had 230,000 pupils. Covering the field of secondary education there were 1,365 boys' high schools, 784 girls' high schools, as well as a large number of technical and vocational schools; 23 universities have over 100,000 students. In addition there are many special schools and colleges, science colleges, academies of art, and conservatories of music, of which the most famous are at Leipzig, Dresden, Stuttgart, Berlin, Cologne, Munich, Würzburg, and Frankfort-on-Main.

*Colonies.*—Up to 1884 German policy was against colonization; but in that year expansion began, and the total area of the German colonies by 1913 was 1,140,117 sq. m. In Africa there were Togo (acquired 1884), Kamerun (1884), German Southwest Africa (1884-90), German East Africa (1885-90); in the Pacific, German New Guinea (1885-99) and the Samoan Islands. The colony of Kiaochau was leased from China for 99 years in 1898. All were lost by the terms of the Treaty of Versailles (1919).

*History.*—For the earliest history of Germany see GERMANY. When Charlemagne succeeded in 771 to the German as well as the Gallic possessions of his father, Pepin the Short, he found himself possessed of an amount of territory and a degree of influence which speedily enabled him to assert supremacy over the whole of the w. of Germany, and to extend his German dominions from the North Sea to the Alps, and from the Rhine as far as Hungary. (See CHARLEMAGNE.) Germany as a separate kingdom dates from the treaty of Verdun in 843. By that treaty the empire of Charlemagne was finally divi-

ded, and Germany fell to the share of Ludwig, or Lewis, the grandson of the emperor. The country fell under the Carolingian line into disorder and confusion, from which it was partially redeemed by Conrad I., who was elected king by his fellow-chieftains and nobles, and his better-known successor, Henry, Duke of Saxony. Henry (919-936) defeated the Hungarians and Slavs, and under his encouragement a great development took place in town life and in trade. Otto I., his son and successor (936-973), was crowned emperor at Rome in 962 by Pope John XII., and reigned until 973, making Germany the foremost power in Europe, and restoring the Holy Roman Empire to its position of supremacy over the civilized world. But though his successors endeavored to continue his imperial policy, it soon became evident that the connection of the Roman empire with the German monarchy was harmful to both. The empire was elective, and thus the German kings were unable to establish a hereditary monarchy, and so to make the central power stable. The German princes constantly aimed at securing a large amount of independence. Hence it was that Germany became divided among a number of powerful states, of which Brandenburg (Prussia), Bavaria, and Saxony eventually became kingdoms.

Otto II., although a strong and capable ruler (973-983), found the difficulties of his position insurmountable; while the cosmopolitan imperialism of Otto III. (939-1002) brought him into direct collision with the German princes and the German Church. His successor, Henry II. (1002-24), made no attempt to carry out ambitious plans, but contented himself with governing Germany. Like Otto III., he failed in Italy. Conrad II. (1024-39) was a wise and far-sighted sovereign, who gave the empire prosperity, and established the royal power on a solid basis. He suppressed rebellions in Italy and in 1027 was solemnly crowned emperor at Rome. Distinguishing between the Italian and German interests of his empire, he not only kept a firm hold in Italy, but never ignored his duties as a German king. In the reign of Conrad's son, Henry III. (1039-56), Hungary, Poland, and Bohemia became fiefs of the empire, peace was to some extent preserved in Germany, and a succession of German popes attested the emperor's influence in Italy. Under Henry III. the destinies of Europe were guided by Germany.

With Henry IV. (1056-1106) the decline of the empire began and was heralded by the

struggle between the ecclesiastical and temporal powers, a struggle which shook Europe, and was not concluded for two centuries. The outbreak of the first crusade in 1075 strengthened the prestige of the papacy. In the twelfth century the church stood at the height of its power. Conrad III. (1138-52), the first of the Hohenstaufen dynasty, found that the growth of municipal autonomy in northern and central Italy was proving a serious hindrance to the assertion of the imperial authority s. of the Alps. To combat this movement, which often developed revolutionary tendencies, was one of the objects of the Emperor Frederick Barbarossa (1152-90). In his efforts to curb the power of the Lombard cities he became involved in a struggle with the papacy, which occupied the best part of his life. (See **FREDERICK I.**) Thenceforward Italy and Germany were practically separated and the claims of overlordship, which were all that remained to the emperors of their authority over the Italian cities, were of the most nominal character. The contest continued for fifty or sixty years until with the death of Frederick II. in 1250 the Roman empire, as it was headed by German sovereigns, lost all possibility of establishing a claim to the government of Christendom. Conrad IV. (1250-4), the son of Frederick II., was the last Hohenstaufen king in Germany, and his death in 1254 was followed by the 'great interregnum,' which lasted till 1273.

A new period in the history of Germany may be said to have begun with the election of Rudolf of Hapsburg to the imperial dignity in 1273. In the meantime disunion had made considerable progress—the central power had declined. A group of principalities were being ruled by powerful families and princes. Otto-car II., who became king of Bohemia in 1253, had added to his dominions Austria, Styria, Carinthia, and Carniola; while at the same time the houses of Luxemburg, Hapsburg, and Hohenzollern were also growing up, all three destined to play a leading part in the subsequent history of Germany. The emperor had also to reckon with the great ecclesiastics, of whom the most powerful were the archbishops of Mainz, Köln, and Trier. Another obstacle to the establishment of a strong monarchical government was the steady development of the German cities. In the s., towns like Augsburg, Ulm, Ratisbon, and Nuremberg, in the n. the Hanseatic league of cities connected with the Baltic trade, all agreed in

resisting any encroachments on the part of the central power.

The reign of Charles IV. (1346-78) is most important in the constitutional history of Germany. By the Golden Bull (1356) he made a noteworthy effort to check the growing disruption of political power. By that instrument he settled all matters connected with the imperial election. The electors were to be seven, three ecclesiastical—the archbishops of Mainz, Cologne, and Trier (Treves)—and four lay—the king of Bohemia, the Count Palatine of the Rhine, the Duke of Saxony, and the Margrave of Brandenburg. The election of the emperor was to take place at Frankfort-on-Main, and the coronation at Aachen (Aix-la-Chapelle). No papal interference was recognized and the growing independence of the German towns was checked. The Golden Bull remained a fundamental law of the Holy Roman empire till its dissolution in 1806. The next hundred years were marked by dealings with the Papacy, the German ruler, Sigismund, taking an important part in the Council of Constance; by the putting down of the Hussite rebellion in Bohemia; by attacks by the Turks; and by periods of civil war.

The reign of Maximilian I. (1493-1519) witnessed a series of attempts to reform the imperial constitution. Since 1486 the imperial chamber had endeavored to dispense justice throughout the empire, but with little success. Already in Frederick III.'s reign a party of constitutional reform had arisen, and in 1495, at the Diet of Worms, this party made its voice heard. But while the electors and greater princes were aiming at the establishment of an aristocratic federation, Maximilian wished not only to maintain his own authority, but also to make the empire hereditary in his family. His want of money, however, led him to agree to the reorganization of the imperial chamber, to the annual meeting of the Diet, and to the establishment of the council of regency—a standing council of the empire.

The election of Charles of Spain as the Emperor Charles V. established the rule of the Hapsburgs over Germany, the Netherlands, Spain, Naples, and a large part of the New World. But in spite of his possessions, Charles V. (1519-56), as emperor, was possessed of little real power. Protestantism divided Germany, and checked all the emperor's efforts to establish his authority over a minority of the princes, backed up by the ma-

jority of the German nation. In the end the reformers grew so strong that in 1552 Charles was compelled to agree to the Convention of Passau, by which it was arranged that a Diet should be called to pacify Germany. In 1555 the Diet met at Augsburg, and a settlement was arrived at which lasted till the outbreak of the Thirty Years' War. Ferdinand I. (1556-65) and Maximilian II. (1564-76) both attempted a policy of conciliation towards the Protestants. But the decrees of the Council of Trent (1564) made reconciliation impossible. With the reign of Rudolf II. (1576-1612) the dreaded crisis drew nearer. A bigoted Roman Catholic, Rudolf was, at the same time, a man of weak will. While the power of the Jesuits grew, Germany suffered from lack of governance; and in 1606 the archdukes of the Hapsburg family met to consider the situation. Matthias, the emperor's brother, was recognized as the head of the house, and Rudolf was forced to resign to him all his dominions except Bohemia. In 1618 the Thirty Years' War began.

During the Thirty Years' War Germany suffered unspeakable ills. Till 1630 the imperial armies carried well nigh all before them. Tilly and Wallenstein proved irresistible. Frederick, Count Palatine and son-in-law of James I. of England, was driven from his dominions, and Christian IV. of Denmark was conquered. Stralsund did indeed hold out (1628) with success against Wallenstein, but nearly all Germany submitted to the emperor. It was not till the landing in 1630 of Gustavus Adolphus of Sweden in Germany that the tide turned. The defeat of Breitenfeld in 1631 and of Lützen in 1632 were most disastrous to the hopes of Ferdinand, and the murder of Wallenstein in 1634 deprived him of his ablest general. In 1635 France entered into the war, and Ferdinand III. (1637-57) was glad to conclude the treaty of Westphalia (1648) with France and Sweden. The counter-reformation had spent its force, and both Roman Catholics and Protestants were ready to accept a compromise. The imperial power was forced to recognize the practical independence of the German princes. The Diet and the imperial chamber still continued to meet, but they had little or no power. Germany had been devastated, and for many years the country lay in 'the insensibility of exhaustion.' By the peace of Westphalia, too, the empire experienced severe territorial losses. Sweden obtained the greater part of Pomerania and the bishoprics of Bremen and Verden as fiefs of the empire, while France

secured legal possession of Metz, Toul, and Verdun, which had been conquered by Henry II., as well as of Breisach and Alsace.

During the long reign of Leopold (1658-1705) Germany slowly recovered consciousness. The attacks of Louis XIV. and the inroads of the Turks exhausted Leopold's already crippled resources. But the ambition and aggressions of Louis XIV. slowly but surely threw the German princes on the side of the emperor. During the war of the League of Augsburg (1688-97) and the Spanish Succession War (1702-13) public opinion in Germany was steadily opposed to France. In alliance with England, Germany successfully contended against the attempts of Louis XIV. to dominate Europe. In 1714 the peace of Baden between the empire and France, following on the peace of Utrecht, closed a long series of struggles which had begun in the days of Francis I. and Charles V.

During the eighteenth century the rapid development of Prussia tended still further to weaken Germany as a unit in European politics. While Frederick William I. had, by 1721, practically driven the Swedes from the N. of Germany, Frederick the Great by the seizure of Silesia (1740-5), enormously strengthened the position of Prussia. But the outbreak of the French revolution undid the work of generations, at least for a time. Napoleon's secularization of the ecclesiastical states, overthrow of Austria at Austerlitz (1805) and of Prussia at Jena and Auerstadt (1806), and formation of the Confederation of the Rhine, completed the extinction of the Holy Roman empire. In 1806, when the new kings of Bavaria and Würtemberg, the electors of Baden, the landgrave of Hesse, and other princes acknowledged the French emperor as their protector, and separated themselves from the empire, Francis of Austria took the title of Emperor of Austria.

After the fall of Napoleon the princes of Germany agreed to unite in a confederation. A permanent Diet of plenipotentiaries from these states met at Frankfort-on-Main under the presidency of Austria. In each state a constitutional government was to be set up. This settlement proved neither permanent nor satisfactory. Between 1830 and 1848 the desire for the unity of Germany was encouraged by the formation (1834) of a customs union (*Zollverein*), which, headed by Prussia, removed many useless restrictions from commerce. Influenced by the third French revolution, which broke out in 1848, popular movements were started in many states, the rulers

of which were forced to adopt a liberal policy. During 1849 and 1850 Prussia and Austria each made independent attempts to unite Germany. While Prussia formed what was called the German Union, Austria endeavored to reconstitute the confederation. Eventually Prussia consented to the restoration of the constitution of 1815, and from September, 1850, the Diet resumed its sittings at Frankfurt.

In 1865 Bismarck, Prussian minister for Foreign Affairs, determined to bring to an issue the question of the headship of Germany. The victory of Prussia over Austria in 1866 at the battle of Sadowa decided the rivalry in her favor. As soon as peace was made all the states n. of the Main formed a North German Confederation under the leadership of Prussia, and the first meeting of the Diet took place at Berlin on Feb. 24, 1867. In 1870 a long-threatened war between Prussia and France broke out (see FRANCO-GERMAN WAR). It was concluded by the peace of Frankfurt (May 10, 1871), by which France was condemned to pay a war indemnity of \$1,000,000,000; and the province of Alsace, along with part of Lorraine, was ceded to Germany. The South German states remained true to Prussia, and during the war decided to unite with the North German Confederation. That body was, after the adhesion of the s. Germans, changed into the German Confederation and on Jan. 18, 1871, at Versailles, William, king of Prussia, was proclaimed German emperor. Prince Bismarck (see BISMARCK-SCHONHAUSEN) was made Imperial Chancellor.

Bismarck's chancellorship is notable for his endeavor to improve the condition of the working classes, with laws compelling employers to insure their workmen against sickness, accident, and old age, and to pay death benefits to their families; for the inauguration of a new strongly protectionist commercial policy, designed to secure larger revenues and to foster German manufactures; for the adoption of a vigorous colonial policy; and for the formation of the Triple Alliance—Germany, Austria, and Italy—which remained in force until Italy's defection in 1915 (see ALLIANCE; TRIPLE ALLIANCE).

On March 9, 1888, the Emperor William I. died. His son and successor Frederick III. lived only a few months, and in June, 1888, William II. ascended the throne. A man of imperial outlook and imperious will, he soon came into conflict with the Iron Chancellor, whose resignation he demanded in 1890, after

thirty-eight years of continuous service. From this time on until his abdication in 1918, the figure of William II. dominates German history. Bismarck's successors being little more than 'tools of his exalted will.' From the first the new Emperor adopted an aggressive commercial and colonial policy which he sought to further by the creation of a powerful navy, by the strengthening of German ties in the Near East, and by the building up of an army equal to any call which should be made upon it. In 1890 he completed arrangements with Great Britain which definitely secured to Germany the possession of German East Africa and German Southwest Africa; in the same year Germany secured Heligoland from Great Britain, and in 1897, taking the murder of two German missionaries as a pretext, she seized Kiaochow.

In 1896 the despatch of an imperial telegram to President Krüger congratulating the Boers upon their successful resistance to the unfortunate Jameson raid (see JAMESON, SIR L. S.) created high feeling in England, while the open expression of Boer sympathies by the German press during the South African War tended to increase the tension between the two nations.

Relations with France, long strained over the misgovernment of the 'lost provinces' of Alsace-Lorraine, reached a crisis in the intervention of Germany in Morocco, first in 1905 (see MOROCCO), and later in 1911 (see AGADIR). Peace was maintained on these occasions by diplomatic interchanges, but Germany's growing ambition for the domination of a Middle European federation (*Mittel Europa*), consisting of the German Empire, Austria-Hungary, the Balkan States, and Turkey, and reaching into the heart of Asia, was hastening the day when diplomacy would no longer avail. Already the Triple Entente (see ALLIANCES) constituted a menace in Germany's eyes, while the outcome of the Balkan Wars—Turkey's practical expulsion from Europe and the growing power of Russia and Serbia—still further threatened her aspirations. War was at length determined upon. The occasion came with the assassination of the Austrian Archduke Francis Ferdinand and the Austrian ultimatum to Serbia in July, 1914. For a detailed discussion of Germany's motives and methods, see EUROPE, GREAT WAR OF.

Germany declared war on Russia, Aug. 1, 1914, following this by declarations against France, Belgium, and Great Britain on Aug. 4. For the next four years German history

is largely that of the War, which completely dominated domestic as well as foreign affairs. The principal political issue during this period was the reform of the electoral system. A bill was passed by the Reichstag with this in view in April, 1917, and in July an imperial rescript ordered the drafting of a bill of reform in Prussia, where the need was greatest. The opposition of the Junkers, or Prussian aristocratic landowners, however, brought this to naught, and caused the downfall of Chancellor von Bethmann-Hollweg, after eight years' service (July, 1917). He was succeeded by Dr. Georg Michaelis, who resigned in October, to be followed by Count Georg G. von Hertling, a Bavarian, and a leader of the Catholic party. On Dec. 6, 1917, the new chancellor introduced a reform bill into the Prussian Diet. Chancellor von Hertling resigned on Sept. 30, 1918, and was succeeded by Prince Maximilian of Baden. In the meantime, demands for peace were becoming insistent, and as the German armies were rolled back on the Western front, popular disaffection spread. On Nov. 9, 1918, the Emperor and the Crown Prince abdicated. On Nov. 10 Friedrich Ebert, a socialist, whose appointment had been the Kaiser's last official act, assumed the chancellorship, and on Nov. 11, the Armistice that ended the war was signed. For the terms, equivalent to an unconditional German surrender, see ARMISTICE. By this time the revolution that had centred in Berlin was spreading through the Empire, and before the end of the month the rulers of twelve states were reported to have abdicated.

The closing weeks of 1918 and the early months of 1919 were marked by the struggle between the Majority Socialists and the Spartacists, or extreme radicals (see SPARTACIDES), for the control of the government. Elections for a constituent assembly held on Jan. 19, 1919, and the meeting of the assembly at Weimar in February marked a victory for orderly government, but rioting still continued. On May 7, 1919, German delegates, headed by Count Brockdorff-Rantzau, the German Foreign Minister, received the Treaty of Peace from the Allies at Versailles (for the terms, see PEACE CONFERENCE OF PARIS). An interchange of notes and counter-proposals followed, and on June 16 the Treaty with slight modifications was again submitted to the delegates. A Cabinet crisis ensued, and the new premier, Gustav Bauer, forthwith despatched a note of provisional acceptance to M. Clemenceau, chairman of the Peace Conference. After further unsuccessful parleyings

for time, the terms were unconditionally accepted on June 23, 1919. The treaty was signed June 28, and ratified by the National Assembly at Weimar on July 9. On July 31, 1919, a republican constitution was adopted by the Assembly at Weimar, and on August 22 Friedrich Ebert, who had been acting as Provisional President, took the oath of office as first president of the Republic.

*Germany as a Republic.*—Before the new republic was one year old, a counter-revolutionary movement threatened its existence. Coming to a head in March, 1920 with the so-called *Kapp Putsch*, led by Dr. Wolfgang Kapp, one of the leaders of the ultra-reactionary *Vaterlandspartei*, it failed, largely as the result of a general strike instigated by the Ebert-Bauer government. The latter now deemed it wise to hold new elections for the Reichstag. Chancellor Bauer resigned, and on March 27 an interim government was formed by Hermann Müller, Social-Democrat, with the coöperation of the Democrats and Centrists. A coalition government of Centrists, Democrats and the People's Party was formed on June 20 with Konstantin Fehrenbach as Chancellor and Dr. Walter Simons, eminent jurist, as Foreign Minister.

A revival of militarism resulted from the new government's inability to secure alleviation from the Allies of the drastic conditions of the Peace Treaty. At a meeting between Dr. Simons and representatives of the Allies at Spa, July 5-16, the question of reparations was referred to an international committee of experts which met at Brussels, Sept. 24, 1920. Early in 1921 the Allies fixed the amount of reparations at 225,000 million gold marks. They also demanded that Germany's disarmament should be completed forthwith in full compliance with the Peace Treaty conditions, threatening as penalties for non-compliance extension of the Rhineland occupation, occupation of the Ruhr and other German territory, seizure of German revenues in occupied areas, and permanent exclusion of Germany from the League of Nations.

This ultimatum, the Allies' refusal to consider any counter-proposals, the loss of part of Upper Silesia by a plebiscite, and a Communist uprising in the Prussian province of Saxony greatly weakened the Fehrenbach-Simons government, and it finally resigned May 4, 1921. It was succeeded by another coalition ministry drawn from Centrists, Democrats and Socialists and headed by Dr. Wirth of the Centre party. On May 5, the Allies presented the London ultimatum, set-

ting the reparation total at 132,000 million gold marks and demanding its acceptance within six days, threatening otherwise with the occupation of the Ruhr. Against strong opposition Dr. Wirth forced acceptance in the Reichstag on May 10. This was the beginning of his program of 'fulfillment,' which caused passionate opposition by the Right parties and culminated in the assassination of Dr. Erzberger on August 26, 1921. The Wirth Cabinet, however, continued to pursue its program, and on October 6, at Wiesbaden, an agreement was signed by Dr. Walter Rathenau and M. Loucheur regarding Germany's deliveries in kind to France on account of reparations. Continued strong opposition to the Wirth program forced the Cabinet's fall on October 22, 1921. Dr. Rathenau was assassinated on June 24, 1922 and the air was full of rumors about plots against the Republic. The Reichstag on July 18, 1922, passed a law for the 'protection of the Republic,' constitutional guarantees were suspended, and censorship was established. These measures were openly opposed by the reactionary government of Bavaria, and on November 14, 1922 the second Wirth Cabinet fell.

The new chancellor, Dr. Wilhelm Cuno, a Hamburg ship owner, a Catholic, and a member of the People's Party, had no use for liberalism. His cabinet, a coalition of reactionary elements of the People's, Centre and Democratic parties, represented Germany's great industrial interests. It, too, was faced by the reparations problem, complicated by a steadily depreciating currency. The German government asked the Allies for a moratorium of all cash payments, at least until the end of 1924. M. Poincaré, spokesman for France, bluntly declared that unless Germany was prepared to give some kind of material security for a moratorium she must meet her reparations payments promptly, and in case she did not the Allies would occupy the Ruhr, and if the Allies were unwilling, then France alone would do so. Chancellor Cuno's attempts to modify the French position failed and on December 27, 1922 the Reparations Commission certified that Germany had defaulted. On January 10, 1923 French and Belgian troops entered the Ruhr.

The occupation of the Ruhr united all parties in Germany behind the Cuno government, which promptly issued orders for a campaign of passive resistance. In a short time one million Ruhr workers were idle. The Ruhr industrialists instead of coming to the assistance of the government seized the opportunity

to attempt to lengthen the working day. But in spite of this fact production declined. At the same time German currency was sinking with amazing rapidity. On January 10, 1923 the mark was 48,000 to the pound sterling; by February it was 250,000; by June 480,000; by July 4,800,000; by the end of August 48,000,000; and by the middle of September 480,000,000. Henceforth it passed into the realm of trillions and quadrillions. Hard money completely disappeared. Untold hardship, especially among the poor classes, resulted. Plunderings and riots became a daily occurrence, and threats and rumors of civil war were heard on every side. It became clear that passive resistance had failed and on August 12, 1923 the Cuno Cabinet's resignation was forced by the Socialists.

A new government including four Socialists under Gustav Stresemann, leader of the People's Party, took control on August 13. Passive resistance came to an end on September 27, following a conference of the Prime Ministers of all German states. To prevent revolutionary outbreaks and possible civil war, Dr. Gessler, Minister of Defence, was given dictatorial power over the entire Reich, and the generals commanding each of the Reichswehr districts were given similar powers locally. To accomplish the stabilization of the mark, Dr. Stresemann demanded special powers from the Reichstag. This demand was at first strongly opposed by the Socialists and the Cabinet resigned on October 3. The disastrous fall of the mark forced the Socialists to give in and on October 6 Dr. Stresemann formed a new government. The Reichstag granted him full power to take whatever steps he deemed necessary to put the country on a sound basis; explicitly excepting, however, any impairment of either the eight-hour day or the social insurance arrangements then in force. However, the Stresemann government was not destined to see through the stabilization of the mark. Its strong measures brought about its fall on November 23, 1923.

Dr. Wilhelm Marx, Centrist leader, formed on November 30 a new minority ministry, with the People's Party, Centrists and Democrats participating. Dr. Stresemann was retained as Foreign Minister and Dr. Hans Luther as Finance Minister. The entire tax system was revised and the whole civil service structure was reorganized. The decree of February 14, 1924, enacting revalorization of private and public debts brought through its terrible harshness complete impoverishment to wide circles of the middle class. In January,



1924, a commission of experts on German finances and reparations had begun its deliberations. It was headed by Charles G. Dawes and in April it handed its report to the Reparations Commission. The Dawes plan (see REPARATIONS), a self-adjusting sliding scale estimate of Germany's ability to pay reparations, was savagely attacked, especially by the Right parties, as a device to enslave Germany.

On May 26 the Cabinet resigned, but Chancellor Marx formed a new ministry on June 3. It had enough strength to carry through the acceptance of the Dawes plan, its prestige having been increased by definite promises from the Allies to begin at once the Ruhr evacuation. Germany suffered a severe loss by the sudden death of President Ebert on February 28, 1925. Dr. Walter Simons, chief justice of the Supreme Court, became Acting President. According to the Constitution the President of the Reich must be elected by direct vote and by an absolute majority. The first election failed to give any of the candidates a majority. Field Marshal von Hindenburg became a candidate for the second election, and he was elected over Chancellor Marx on April 26, 1925. The Luther Cabinet had to its credit two notable achievements, the evacuation of the Ruhr and the conclusion of the Locarno pact. The former was completed by France on July 31, 1925. At the Locarno conference, October 5-16, Germany, represented by Dr. Luther and Dr. Stresemann, agreed with England, France, Italy and Belgium on a mutual security pact and secured admission to the League of Nations. Passed by the Reichstag on November 27, the Locarno pact was signed on December 1. Four days later the Cabinet resigned. It was not until January 2, 1926, that Dr. Luther succeeded in forming another Cabinet, with Dr. Stresemann again as Foreign Minister. During its short existence a Franco-German trade treaty was signed on February 12 and a German-Soviet pact was concluded on April 24. The latter provided for mutual neutrality and economic boycott in case of offensive wars. On September 10, Germany was unanimously elected a member of the League of Nations and received a permanent seat on its Council.

Meanwhile during 1927 much important new legislation was passed, including a new tariff with higher agricultural duties, the unemployment insurance act, and an act restricting overtime labor. Economic and financial conditions in Germany began to assume alarming aspects. On October 20, 1927 Agent

General Gilbert of the Reparations Commission addressed a note of warning to the government pointing out the absolute necessity for cutting down governmental expenditures and for stopping further expansion of credit. After forcing the passage of emergency bills in behalf of agriculture, the government had the Reichstag dissolved by President von Hindenburg on March 31, 1928. In the elections of May 20 thirty political parties participated actively. On June 29, 1928, the Marx Cabinet was succeeded by one headed by Hermann Müller, Socialist leader with Dr. Stresemann as Foreign Minister and General Groener as Minister of Defence. It concluded trade agreements with several countries, and on August 27 Dr. Stresemann signed at Paris the Briand-Kellogg Treaty for the renunciation of war. Meanwhile trade and industry fell off with alarming rapidity. A strike of dock workers lasted several months and a lockout of 250,000 metal workers in the Ruhr caused much suffering.

The year 1929 marked another milestone in the history of reparations. On February 12 a new international commission of experts met in Paris to try to settle this vexatious problem. It elected as its chairman Owen D. Young, famous American industrialist and collaborator of Charles G. Dawes on the 'Dawes Plan.' The final report of the commission, signed on June 7 and popularly known as the Young Plan (see REPARATIONS), lowered the annuities set by the Dawes Plan, but greatly prolonged the period over which they were to be paid. In Germany the Young Plan aroused strong opposition, especially on the part of the parties of the Right. It was not until March 12, 1930 that the Reichstag approved the Young Plan, approving also at the same time a separate reparation agreement with the United States. The Bank for International Settlements, one of the important features of the Young Plan, commenced operations on February 26, 1930 at Basle, Switzerland. Dr. Schacht resigned as president of the Reichsbank on March 7 and was succeeded on March 11 by Dr. Hans Luther, former Chancellor. In the meantime Germany had suffered a great loss in the sudden death on October 3, 1929 of Foreign Minister Stresemann. He was succeeded by Dr. Julius Curtius.

Financial and budget reforms pressed by the government after that created such strong party feeling that the Cabinet resigned on March 27, 1930. Dr. Heinrich Brüning, Centrist leader, formed a new Cabinet from mem-

bers of the middle parties and was able to carry through most of his financial reforms and his farm relief program.

The departure of the last French troops from the Rhineland caused great popular joy in Germany. In November the German debt to the United States, partly on account of awards made by the Mixed Claims Commission and partly on account of the costs of the American Army of Occupation, was funded, the total amount involved being 3,169,700,000 reichsmarks. Communists and Fascists caused many disorders throughout Germany during the early part of 1931, and at the end of March the President established a constitutional dictatorship to overcome these outbreaks.

During June, 1931, gold and exchange withdrawals from the Reichsbank reached unprecedented totals and between June 1 and June 12 more than 650,000,000 marks or about one-quarter of the bank's reserves were thus withdrawn. Finally on the evening of June 20, President Hoover issued his historic statement calling for a moratorium on reparations. See REPARATIONS; U. S. HISTORY. On July 13, an emergency decree ordered all banks closed for two days. This was followed by other emergency decrees, including one which placed all foreign exchange under the control of the Reichsbank. On July 18 Chancellor Bruening and Foreign Minister Curtius came to Paris and consulted with Premier Laval and Secretaries Stimson and Mellon, both of the latter being then in Europe. A seven-power conference met in London on July 20, to find means for relieving Germany. It concluded its deliberations three days later by accepting, in their essentials, proposals made by the United States Government through Secretary Stimson. These various international conferences went far to restore confidence in Germany's stability. Early in August Germany's banks opened again for full normal business and about a week later the Reichsbank lowered its rediscount rate from 15% to 10%, a further reduction to 8% being made on August 31.

Late in September, 1931, Premier Laval and Foreign Minister Briand were received in the German capital. Their visit resulted in the establishment of a Franco-German economic commission, to promote mutual efforts between the two countries in commerce, finance, shipping and aviation. Early in October Dr. Curtius resigned as Foreign Minister and on the next day the entire Bruening Cabinet resigned. Within two days Bruening formed a new coalition Cabinet in which General Gro-

ener retained the portfolio of Defence and was also given that of the Interior, thus combining control of the army and police. The new government faced a hostile Reichstag, but a 'no confidence' vote was defeated by 25 votes. As a result the National Socialist Hitlerite deputies again left the Reichstag in a body. The Reichstag then adjourned until Feb. 23, 1932.

In the meantime the Fascist movement directed by Adolf Hitler gained daily many new supporters, winning important victories in elections. Early in December, 1931, a Communist motion to convene the Reichstag immediately was defeated by that body's Council of Elders. Hitler continued to announce his expectation to take over the government before long and to pronounce, in vague terms, his program. The answer of Bruening was another emergency decree, at once the most extensive and most severe of any issued so far. It consisted of strong measures against Fascism and political and economic measures of great severity and far-reaching influence. Hitler's response to these measures, directed largely against himself and his Fascist movement, was an 'open letter' to the Chancellor. It seemed to come as an anti-climax, received comparatively little notice and apparently did not make a great impression either in Germany or abroad.

Thus the beginning of 1932 still found the Bruening-Hindenburg-Groener triumvirate in power, boldly facing a future bearing portentous problems. They were not destined to rule for long, however. A presidential election was held March 13. The chief issue was whether Bruening and the moderate coalition parties led by the Social Democrats and the Catholic Centre should hold power or give way to groups hostile to the republic. On the first ballot President von Hindenburg barely failed of the requisite majority; on the second ballot, April 10, von Hindenburg, as expected, was re-elected President, with a plurality of nearly 6,000,000 votes over Hitler. In the State elections of April the Nazis won a larger number of seats than any other party in Prussia, Württemberg, Hamburg, and Anhalt, and came second in Bavaria. Bruening and his cabinet resigned May 30, feeling that the dictatorial system of government by decree no longer enjoyed popular support. Colonel Franz von Papen was thereupon invited to form a cabinet. A member of the extreme Right wing of the Centrist party, his ministry consisted of Right members representing heavy industry, the Army, and conservative agrarian interests. The strong man in the new

government was Lieut.-General Kurt von Schleicher, Defence Minister. Hitler had not sought the post of chancellor since he knew that he could not yet command a Reichstag majority. The Reichstag was dissolved by a decree of the President, and a general election was set for July 31.

From the report of the Young Plan Advisory Committee in December, 1931, in Basle, and from other evidence it was apparent that Germany could no longer bear the burden of reparations. Hence, on July 9 at Lausanne the Young Plan was superseded by an obligation involving \$714,000,000, which Germany agreed to deliver to the Bank for International Settlements in 5 per cent. redeemable bonds. But Great Britain, France, Italy, and Belgium signed a 'Gentlemen's Agreement' the same day, making ratification of this reduction of Germany's obligation dependent on a reduction of their war debts due to the United States. As a result of political disorders which preceded the election of July 31, involving fights between Nazis and Communists, President von Hindenburg re-imposed the ban (raised by von Papen) on brown shirt demonstrations and on July 20 appointed the Chancellor as Federal Commissioner of Prussia. The latter thereupon ousted the Prussian Premier and the Minister of the Interior. The President also imposed a military rule on Berlin and the Province of Brandenburg.

In the election the Nazis nearly doubled their popular vote, winning 230 seats in the Reichstag, or 37 per cent. of the total number, but still falling short of a majority, even with Nationalist support. The Nazis immediately demanded that Hitler, as head of the largest party, be made chancellor. On August 13 von Hindenburg offered Hitler and some of his followers posts in a coalition cabinet to be headed by von Papen. Hitler refused, demanding instead the entire executive power, which the old President sternly refused. In September, in accord with its nationalistic policy, the Hindenburg-Papen-Schleicher government, dissatisfied with responses to Germany's demand for armaments equality, announced Germany's withdrawal from the Disarmament Conference. At the same time it expressed the hope of securing treaty revision and the return of the land and colonies lost during the World War. Construction of the third 'pocket battleship' permitted Germany under the Versailles Treaty was ordered to be begun and the creation of twenty military sport camps (expected to enroll 300,000 young Germans) was

decreed, although these were not sanctioned by the treaty.

In the Reichstag elections of November 6 the Nazis lost about 2,000,000 of the votes they had polled in July, and 35 Reichstag seats. No party or coalition secured a majority. Since von Papen was unable to win support for a 'cabinet of national concentration' von Hindenburg on November 19 asked Hitler to attempt this. The Nazi leader, unable to overcome party and personal antagonism, asked to be made Chancellor of a presidential cabinet able to rule by decrees in defiance of the Reichstag. The President thereupon imposed conditions which Hitler refused. On December 2 von Hindenburg appointed Lieut.-General von Schleicher, who retained the Defence portfolio and continued as Federal Commissioner of Prussia. He announced his policy as substantially the same as von Papen's, its chief item the creation of work.

In session December 6-9, the Reichstag amended Article 51 of the Constitution, providing that the duties of the President, if he were disabled, be assumed by the president of the Supreme Court instead of by the chancellor. This removed a probable objection of von Hindenburg's to Hitler's becoming chancellor. Von Schleicher resigned on Jan. 28, 1933, failing to receive a presidential decree for the dissolution of the Reichstag. On January 30 von Hindenburg, on Papen's advice, made Hitler Chancellor. The Nazi leader came to power, however, on nothing like the terms he had at first demanded. Expected to be a check on him was the appointment of Papen as Vice-Chancellor and Federal Commissioner of Prussia; of two Nationalist leaders, Alfred Hugenberg and Franz Seldte; and of four prominent members of the preceding cabinet. With von Hindenburg's permission Hitler dissolved the Reichstag on February 1. By strong-arm suppression of all demonstrations by opposing parties the Nazis made striking advances in the March 5 election, winning about 17,300,000 votes and 288 seats (a gain of 92), or 44 per cent. of the Reichstag seats. This, coupled with the 8 per cent. representation of the Nationalists, gave the government *bloc* a majority.

Charging that a fire in the Reichstag building had been started by Communists, the Nazis assumed dictatorial powers to cope with the alleged emergency. It was widely charged that this fire had been ordered set by Nazi leaders for political reasons. Later in the year, when the five men accused were brought

to trial (September 21), the four Communists who had been taken prisoners by the German police were acquitted; and the fifth defendant, Marinus van der Lubbe, was convicted in the face of his refusal to admit that he had any accomplices, although it was apparently shown that he could not have committed the deed single-handed.

The act had, however, served its purpose. The end of the republic was at hand. The black, red, and gold flag of Republican Germany was officially supplanted by the old black, white and red flag of Imperial Germany, together with the Nazi swastika. The new Reichstag, meeting at Potsdam (as opposed to Weimar, where the republican Constitution had been drafted), on March 23 passed five sweeping articles making Hitler dictator for four years, to issue emergency laws in disregard of the Constitution and without the approval of the Reichstag or the President, or subject to popular referendum; authorized the cabinet to conclude treaties with foreign nations, decree the annual budget, and borrow money on its own authority. The right to dismiss cabinet members, the supreme command of the Reichswehr, and the sole power to proclaim martial law remained with the President.

The rise of the National Socialist party and the national revolution which followed Hitler's accession to power had their roots in three essential factors: the harsh terms of the Versailles Treaty; weaknesses in parliamentary government which hampered concerted leadership; and the aggravating effect of the economic depression. In promising to scrap the Treaty of Versailles, pay no more reparations, abolish interest, and countless other high-sounding but vague objectives, the Nazi program did not differ materially from that of other parties, calculated to appeal to all the German elements of discontent. The fervid oratory of Hitler, and the vigorous activity of Paul Goebbels, Minister of Propaganda, were major causes of the Nazi success. One definite principle the Nazis had adopted, however: anti-Semitism.

Promptly after their victory in the March 5 election the Nazis began a wholesale persecution of the Jews, both physical and social. A law passed on April 12 provided for the expulsion from all branches of the German civil service of Jewish officials, with some exceptions. Jewish judges, lawyers, doctors, professors, teachers, scientists, musicians, public officials, and business men, small and great, were deprived of their living, and students

were excluded from the schools and universities, except for a limited number. Intolerance extended even to German Jewish scientists and artists of world-wide renown. Again, in May, German university students participated in a burning of books written by Jewish authors—including probably a majority of Germany's contemporary literary luminaries.

Originally it was hoped that Hitler's hands would be effectively tied as Chancellor by the very possession of power and the presence of von Papen and other ministers not of his choosing in his cabinet. Events turned out otherwise; by a veritable revolution the Nazis assumed complete control of Germany. The abrogation of States' rights, begun by von Papen, was continued to the complete federal domination of State governments. A struggle of the Nationalists with the Nazis was ended on April 8 when Hitler, as Governor of Prussia, appointed his first lieutenant, Goering, instead of von Papen, as Premier of Prussia. Hitler's next move along political-religious lines was in connection with the churches. In an effort to preserve their freedom in spiritual matters, the Lutheran and other Protestant denominations had merged their 29 separate organizations into a single body, the German Evangelical Church. The Nazi elements in this organization promptly disputed the election of the non-political clergyman, Dr. von Bodelschwingh, as their bishop. Hitler's lieutenant, Goering, immediately announced that as Premier of Prussia he had the right to act as supreme bishop of the Prussian church and chose his own Nazi churchman, August Jaeger, as Reich Church Commissioner for Prussia. The latter proceeded to fill all the positions with Nazi German Christians.

The protest against these acts was so strong that, in response to many pleas, President von Hindenburg finally took the matter up, writing an open letter to Chancellor Hitler in which he urged him to act to end dissension within the Church. Herr Jaeger was immediately recalled by Hitler, the non-Nazi churchmen were restored to their former offices, and the promise was given that a new constitution for the churches would shortly be drafted. This constitution, when announced, seemed to lean toward the creation of an independent church; but its relation to the government was soon demonstrated by the election of a Nazi majority, who chose Dr. Mueller, a strong Nazi churchman, as Reichsbishop. But in raising the issue of the domination of church by State, Hitler was treading on ground in which the church had a long

and hardly-won liberty of conscience to protect. A League of Opposition was immediately formed, and became so strong that the Chancellor advocated caution among his supporters, postponing for a time the consecration of Dr. Mueller as Reichsbishop. The protest of the 3,000 Evangelical Pastors was made November 19, 1933, on the four hundred and fiftieth anniversary of Luther's birth.

During the same period Hitler was meeting a similar Catholic problem. Before the political parties were disbanded, in the spring and summer of 1933, the Catholic Centre party and its ally, the Bavarian People's Party, had been able to poll about five and one half million votes. During the summer of 1933, largely due to the efforts of Franz von Papen, the German Government and the Vatican came to an agreement, embodied in the Concordat signed on July 20, by which, among other things, the Vatican undertook to restrain all German Catholic ecclesiastics from joining or supporting any Catholic political party. Other provisions were to safeguard the Church's authority in ecclesiastical discipline and matters of religious education and morals. This agreement failed to have the desired effect, especially as the Nazi regime proceeded to take up racial matters, emphasizing its Aryan policy and declaring for the sterilization of the unfit. In December, 1933, the world saw the Cardinals of the German Catholic Church calling on the Protestants to unite with them in defending Christian faith and practice against paganism and rabid nationalism.

In the beginning of 1934 the tension was marked. The government's sterilization program was being put into effect, applicable to an estimated 400,000 men and women who had any one of nine designated hereditary diseases. Catholics sentenced to this measure were to be permitted to accept incarceration in institutions as an alternative. Cardinal Faulhaber, Archbishop of Munich and Freising and head of the Bavarian Episcopate, was one of the Catholic prelates who was strongly anti-Nazi. He proceeded fearlessly to deny the Nazi doctrine of racial superiority in a series of sermons. There were mob demonstrations in Munich and in Wurzburg, another Catholic stronghold. The Nazis were organizing the youth of the country into 'Hitler Youth.' The young man who became leader of that powerful movement instituted a vigorous campaign to bring the Catholic youth groups under his control. The Protestant Church situa-

tion was continuing difficult. In Germany the theory of Protestant church membership had been that any man or woman was a member if he or she had ever been baptized or confirmed, no matter what their adult relation to any active congregation. It was therefore possible to mass large numbers of Nazis in any church assembly for the purpose of voting on these lines. On May 29-31, 1934, the first National Free Synod met and organized at Barmen, in Westphalia, with several thousand opposition Christians in attendance. (Five days previous to the arrival of the delegates the Governor of Westphalia had issued a decree prohibiting mention of church conflict in the press, thus limiting all possible publicity to word of mouth of the delegates.) This synod proceeded to create a new church in Germany, with a new council of elders, with its faith defined in six theses which emphasized the Christian revelation as the supreme authority, insisted on the need of independence of church and state, and declared strongly against the totalitarian idea. It announced itself as the true evangelical church of Germany, as over against the 'German Christians' of the Nazi persuasion, and claimed entire independence of Reichsbishop Mueller. So matters stood at the beginning of July when there came the violent 'purging' by Hitler of his Storm Troops and circle of leaders in suppression of a revolt which he announced to have been imminent.

Politically, the Nazi regime had showed its ultimate goal to be the so-called 'Totalitarian State,' in which every activity of the German people would come to be included by a unified and supervised program. This presupposed the elimination of party units as the nation was organized into a one-party state. Towards this end Hitler began to work in June, 1933. The Communist party had been dissolved, following the Reichstag Building fire. There had followed in rapid succession the Social-Democratic party, dissolved on the basis of being guilty of high treason; the Nationalist party, led by Hugenberg, dissolving voluntarily; the State Democratic party, the Bavarian People's party, and the German People's party deciding to disband; while the Catholic Centre party was dissolved by the signature of its leader, Former Chancellor Bruening, to a decree to that effect in July. The National Socialists thus remained the only political party. The principle of the one-party state was formally written into German law by a decree of December, 1933—a decree which also incorporated Hitler's organization

of 'Brown Shirts' as units in the military forces of the nation. Another decree promulgated in the same month limited the number of students permitted to attend universities in 1934 to 15,000 (10,000 less than had been registered in 1932), and allowed for the admission of only one woman for every ten men.

This latter measure was in pursuance of a policy which should return women, insofar as possible, to the home, free masculine labor from their competition, and serve ultimately to increase the national birthrate, a policy which was pursued with greater intensity during 1934. The year 1933 had ended with the Hitler control extremely strong. On Dec. 12, the all-Nazi Reichstag had assembled with only two of its 661 members not National Socialists, the names of Vice-Chancellor von Papen and Dr. Albert Hugenberg having been allowed on the ballot apparently as a Hitler gesture of conciliation. Already the German 'Concentration' or prison camps were crowded with political prisoners, the estimates in the latter part of 1933 and the early months of 1934 being of 60,000 men being herded together in 65 prisons, many of them improvised shelters of the roughest kind. Save for the occasional visits of press correspondents, under strict surveillance, and such reports as have come from escaped prisoners, the outside world knows little of these camps. But that little is enough to show a ruthless and barbaric regime, with hundreds of prisoners confined without trial, charge, or specified term of sentence, and under intolerable conditions, with frequent application of torture. In the elections of November, 1933, prisoners were told, it is said, that if they registered disapproval of the government, they would be subjected to beatings and other punishments. But in spite of threats, a considerable number of 'no' votes were registered.

Refugees from Germany, as a result of Hitlerism, were estimated on Dec. 23, 1933, by Dr. James G. MacDonald, League of Nations expert, to be about 60,000, 86% of whom were Jews, more than a tenth of whom had gone to Palestine. Nearly half the refugees were in France. The Reichstag passed, on the first anniversary of Hitler's Chancellorship (January 30, 1934) a bill abolishing all State legislatures and the federal Reichsrath. Thus the entire federal system was giving way to the totalitarian state. Facing a financial crisis Germany announced on June 14, 1934, a six-months' moratorium on war debts, including Dawes and Young loans. On June 17, while political and religious circles were seething

with unrest, Vice-Chancellor von Papen, a Catholic, the only non-Nazi in the German government, declared in an address to Marburg students that since open and honorable discussion was not to be found in the German press, statesmen must 'name things by their proper names.' This address with its moderate criticism of the Hitler and Nazi regime was suppressed in Germany, while it appeared in the newspapers of the rest of the world. On June 30 Hitler moved to crush rising revolt among his own leaders. Captain Ernest Roehm, chief of staff of the Storm Troops, was shot; General Kurt von Schleicher, former chancellor, was killed; other National leaders, among them Dr. Erich Klausener, president of the Catholic Action Society and Adelbert Probst, leader of the German Youthful Strength organization, were also among the number (claimed by Hitler in his report late in the month to the Reichstag to be only seventy-seven) to be executed during this reign of violence. Von Papen was held a virtual prisoner in his house, his life being saved, in all probability, by the intervention on his behalf of President von Hindenburg. He was sent shortly as Minister to Austria in her time of crisis.

Following immediately on this crushing of revolt came the death of President Paul von Hindenburg, veteran of 86 years, president for nine years, with a strong war record behind him, the ideal civic as well as military figure of Germany, beloved and admired by all his countrymen. Adolf Hitler assumed immediately, on August 5th, the office of President as well as Chancellor, selecting as his title 'Der Fuehrer'—'The Leader'—and calling a 'free plebiscite to ratify this decision of the cabinet.' The plebiscite of August 19 showed 38,400,000 'yes' votes, with 4,340,000 'no' votes, a considerable percentage of increase for the opposition since the November, 1933, plebiscite on the withdrawal from the League of Nations by Germany. The number of Storm Troops was reduced after the purge from 2,500,000 to 800,000.

Soon after the success in the Saar, the German Government abandoned all pretense of abiding by the military restrictions imposed at Versailles, and announced that until other nations disarmed in accordance with their pledge at Versailles, Germany would maintain an armed force second to none on the Continent. The outlawed air force was recreated and greatly strengthened, universal conscription was restored, the naval force was strengthened, especially in its submarine

branch, and the Reichswehr, or standing army, was increased far beyond the treaty limits. The other Powers gathered in a series of conferences to discuss defense measures against the new armed threat, France, Italy and England increased their arms, and despite Germany's protestations that it sought only peace and equality, war seemed imminent.

In the fall of 1934 Dr. Ludwig Mueller was finally installed as Reichsbishop of the German Church, with a colorful Nazi ceremony, and bishops acknowledging his authority were placed in every part of Germany except Wurttemberg and Bavaria, which were still holding out against the Nazi church regime. Later, through the energetic efforts of Dr. August Jaeger, legal administrator of the Reich Church, and with the help of the State police, these two outstanding churches were incorporated. They yielded outwardly, but inner unity was still absent. Bishop Theophil Wurm, head of the State Church of Wurttemberg, and Bishop Otto Meiser, of Bavaria, were compulsorily retired and kept under 'house arrests' for certain periods because they failed to obey Dr. Mueller's order; and it was said that of 1,220 pastors 980 indicated their determination of independence.

Meanwhile, during the year and a half of church controversy, Hitler himself had seemed to take a moderate and reasonably conciliatory stand, giving hearings to representatives of the opposition. They boldly called on him in October to 'recognize that in church matters, the church and the church alone is justified to pass judgment and reach decisions upon its teachings and discipline.'

Hitler's economic program had begun immediately after his assumption of a virtual dictatorship. An Economic Commissioner was appointed to bring all German industries under Nazi control. At a Grand Economic Council in September, 1933, the government announced its program for ending unemployment and stimulating productive enterprises. During the previous summer, some 250,000 young men had been enlisted in 'labor battalions,' the purpose of which was to revive individual initiative in economic reconstruction. This was part of a 'Youth Movement' which was one of Hitler's chief and for a time, at least, most successful moves. The condition, mental, moral, and physical, of Germany's youth had been serious. The effects of the World War were heavy in their pressure on this generation. They found themselves and their country in a position which seemed to offer no hope for the future. Embittered and

disillusioned, they were in a desperate mood as the financial difficulties of Germany grew steadily worse. To Hitler's summons to work for a new, independent Germany, relieved of the burdens of the Versailles Treaty, they responded with enthusiasm. The military element of his organizations won their approval. The 'youth' groups spread under Nazi propaganda over the entire country. How far this youth loyalty is now being held, it is difficult, if not impossible, to say. The iron hand of the Nazi regime presses hardly on the young men who wish university training and find the number of permits for admission cut nearly in half. There has been violent resistance in some cases to the nazification of University fraternities, as is shown by the reports from Göttingen, where the story 'leaked out.' As in other matters, support of the Hitler policies will probably depend, to a large extent, on his success in restoring prosperity. At the moment, one would judge that the sentiment of the youth movement was divided.

Hitler's apparent aim has been to rebuild the economic system of Germany on the lines of the small unit—the home, the farm, the small landholder, the small agriculturist—instead of working to over-stimulate or increase the spread of the industrial manufacturing system, with its concentration of population in cities. To this end he has set the ideal of the woman in the home, the large family, etc. Yet he has not failed to take account of the problems of labor. A new law was announced to take effect May 1, 1934, for the division of national labor into five main divisions: the heads of concerns, the trustees of labor, the 'social honor' courts, the regulation of wages, and the protection of the workman against dismissal. Before the War, and increasingly since the War, Germany had gone far, under the leadership of its strong Socialist parties, in labor legislation. Under this new law each enterprise with more than twenty employees has its 'confidential council' which the employer is expected to consult in all cases of needed adjustments. These courts of 'social honor' consist of one representative of the employer, one workers' representative from the 'confidential council,' and one 'trustee of labor,' supposed to be an impartial governmental representative. It will take a long period of practical use of these courts in many individual cases to determine their fairness and successful operation.

The foreign policy of the Chancellor has been simple and direct. All Germans were to be united in a great Germanic state (which

should ultimately include all Germany's former colonies); the provisions of the Versailles treaty were to be abrogated; and recognition of Germany's equality, without reservation, with other sovereign states was to be insisted upon. This led to the withdrawal of Germany, on October 14, 1933, from the Disarmament Conference and the League of Nations. In explaining this act to his own people and to the world, Hitler disclaimed any personal or national desire for aggression; declared that Germany did not seek re-armament but was in principle sympathetic with President Roosevelt's proposal of that year for a world non-aggression pact; and insisted that the withdrawal from this 'family of nations' was solely because Germany could no longer accept 'the perpetuation of an unbearable discrimination' against it.

Although by the Versailles treaty, Germany was allowed an army of only 100,000, Hitler announced on March 16, 1935, that Germany would immediately reintroduce compulsory military service and would increase the peace basis of the army to approximately 600,000. He disclaimed any responsibility for the World War on Germany's part, and sought to remove its influence on the people by remilitarizing the country.

In 1936 and 1937, there was unity of action between Germany and Italy in regard to the civil war in Spain. Both Germany and Italy recognized and supported the Spanish rebels under General Franco.

The end of 1936 saw Germany organizing international opposition to Soviet Russia, particularly a so-called anti-Communist alliance which it entered into with Japan and Italy.

During 1936 and early in 1937, Germany's rearming developed at a quick pace. It was openly admitted that military roads were being built across the country so that Germany might send its forces either East or West. New forts, barracks and battleships were built. Sensational increases in military aviation were reported. The country was put on a semi-military basis, and the people were urged to economize and save food and supplies for the "future defense of Germany."

A definite accord was entered into with Italy in 1937, which came to be known as the "Rome-Berlin Axis". In 1938 Austria was over-awed by show of force, seized and taken over by Germany. Meanwhile the Nazis fomented unrest among the Germans living in the borders of Czechoslovakia. The latter country made ready to resist German

aggression, but France and Britain being unprepared for war attended the Munich conference with Germany and Italy, September 1938, and bartered Czechoslovakia's Sudetenland to Germany as a price for European peace. This demoralized Czechoslovakia, and in March 1939, Germany, without meeting resistance, extinguished that country, taking over the major portion of it and permitting Hungary to seize the small remainder. The German Nazis next grabbed Memel from Lithuania and began to arouse the Germans of Danzig and the Polish corridor in an aggressive move against Poland.

Undeterred by the pledges of France and England that they would fight if Germany attacked Poland, Hitler ordered his armies to move Sept. 1, 1939 and in three weeks had completely overrun western Poland. As the Nazi forces neared the Russian frontier, the Soviet troops also moved and the Russo-German lines met. Three days after the opening of the Polish invasion France and England had declared war and were massing troops on the western front. Hitler ordered his victorious Polish expeditionary forces to the west where they massed along the frontiers. On land there was only desultory fighting in the winter of 1939-40. In the spring Germany seized Denmark without a fight, Norway after a brief battle with Norwegian and British troops and then began a devastating assault on Luxemburg, Holland, Belgium, and France. Within 60 days those countries were completely defeated, the former three were occupied as were all the northern provinces and Atlantic seacoast of France including Paris. July 29, 1940, the Nazis began mass air attack on England. In the spring of 1941 Hitler vanquished the Balkans and the island of Crete, thus placing his air bombers within effective distance of Suez. In April he sent reinforcements into Libya to aid Italy, and in June attacked Russia. For two months the battle raged along a 2,000-mile front, the Nazis making great gains; but by Feb., 1942, the Russians had the Germans retreating along the entire line. In the summer of 1941 England's airforce began mass bombing of German industrial cities, including Berlin, and Dec. 11, 1941, Germany declared war on the U. S. By the summer of 1943 Allied air forces were creating havoc in Germany, the Nazis had been driven from Africa and Sicily and along the Russian front. The Allies were massing for attack on Hitler's "fortress."

(continuation in World War II Chronology)



See Headlam's *Foundation of the German Empire*; E. Richard's *History of German Civilization*; H. E. Marshall's *A History of Germany*; Gooch's *Germany* (1926); Kuno Francke's *German After-War Problems* (1927); M. Schacht's *The Stabilization of the Mark* (1927); R. L. Buell's *Europe, A History of Ten Years* (1928); H. G. Daniel's *The Rise of the German Republic* (1928); J. W. Angell's *Recovery of Germany* (1929); E. Luehr's *New German Republic* (1929); P. Scheidemann's *Making of New Germany* (1929); H. von Seeckt's *Future of the German Empire* (1930); B. H. M. K. von Bülow's *Memoirs* (1931); M. Baumont's *Fall of the Kaiser* (1931).

### Germany: Language and Literature.—

German is a branch of the Teutonic division of the Aryan family of speech. Its development followed from the 7th century onward, along two main lines—High German, which became the official language; and Low German, which is spoken principally in Schleswig-Holstein, Mecklenburg, Pomerania, Hanover, and Westphalia. Both have attained the dignity of literary tongues. The history of German literature begins with the 10th century, its typical forms being vernacular songs of the old heathen gods and heroes, and monastic poems of a religious character, mostly composed in Latin.

Out of the powerful influences of the crusades and the splendid court life of the Hohenstaufen emperors arose the golden age of the *Minnesänger*. The most famous of these men were Heinrich von Veldeke (*Encide*), Gottfried von Strassburg (*Tristan und Isolde*), Wolfram von Eschenbach (*Parzival* and *Titurel*) and Walter von der Vogelweide, who won especial renown as a song-writer. From the beginning of the 14th century the traditions of this courtly school began to be adopted by men of burgher extraction. Three great mystic preachers of the 14th century are Eckhart, Suso, and Tauler.

Luther's translation of the Bible marks the effective beginning of modern German Literature. Luther also wrote notable hymns, as well as sermons, letters, *Tischreden*, etc., all in the vernacular. During the barbarous period of the Thirty Years' War and the years of utter exhaustion which followed it, not only were the writers few but they hardly ever rose above a dull mediocrity.

A new impulse was given to German literature by the dry and uninspired Leipzig professor Gottsched (1700-66), who set up to be a dictator of taste in *belles-lettres*, his stand-

ard being a 'Germanized' version of the pseudo-classicism of Boileau and Racine. At the same time another school of quite different tendencies arose in Switzerland, its leading spirits being Bodmer (1698-1783) and Breitinger (1701-76). Some of Gottsched's most talented disciples, revolting against his dictatorship, endeavored to infuse some breath of life into his models in a collective work known as *Die Bremer Beiträge*. However, the Franco-classical standards still continued to dominate German literature until the publication, at intervals between 1748 and 1773, of Klopstock's *Messias*. Wieland founded the first German literary periodical *Der Deutsche Merkur*. Truer views with regard to art and literature especially in the domain of poetry and the drama, were convincingly taught, by a man of rare attainments and a sterling love of truth, Lessing (1729-81); and the true value of the ancient Greek love of beauty was set forth by Winckelmann (1717-68).

When Rousseau trumpeted abroad his gospel of 'Back to Nature!' there were none who welcomed it with greater enthusiasm than the Germans. This period is known as the *Sturm und Drang* (tempest and passionate ardor). One of its earliest, as also sanest, exponents was Herder (1744-1803).

But the genius of Goethe and of Schiller was too original, and their spirit too great, for them to remain infected by the unhealthy ferments of this revolutionary epoch. In both cases ferment led to clarification, and subsequent development of a high poetic-character, for nine years (1796-1805), in the harmonious interaction of a friendship of the closest kind. Goethe (1749-1832) displayed a breadth and comprehensiveness of outlook, a ripeness of wisdom, and a mastery of subject and of style, which have stamped him as one of the greatest writers of all times. His sovereign power is exhibited in dramatic works differing so widely in scope and treatment as *Egmont*, *Iphigenia*, and *Torquato Tasso*; in the idyll, *Hermann und Dorothea*; the romance of *Wilhelm Meister*; the unique autobiographical *Wahrheit und Dichtung*; a host of lyrics of the very first order; and, lastly, the culminating achievement of his life, the profound philosophical poem of *Faust*. Goethe also made valuable contributions to botany and, in a far less degree, to physics (*Farbenlehre*). Schiller's works embrace dramatic poems (*Wallenstein*, *Maria Stuart*, *Jungfrau von Orleans*, *Wilhelm Tell*), lyrics (*Das Lied von der Glocke*), and especially ballads, and

discussions on the philosophy of art (*Aesthetische Erziehung des Menschen*), all ranking among the best-loved productions of German literature. Besides this, he showed in his historical writings (*Geschichte des dreissigjährigen Kriegs*, *Geschichte des Abfalls der Niederlande*) that German prose could be written with grace as well as made to glow with sustained eloquence, while at the same time retaining its native depth of thought. Richter is the greatest philosophical humorist Germany has produced, his humor ranging from the grimmest scorn to the tenderest irony. In addition to his longer romances he wrote charming idylls (*Fixlein, Wus*) of a simpler character, shorter satirico-humorous pieces (*Fäbel, Freudel, Schmelzle's Reise, Dr. Katzenberger*), treatises on education (*Levana*) and art (*Vorschule der Aesthetik*), and a delightful autobiography. Between 1775 and 1832, or during the residence of Goethe, Weimar was the literary capital of Germany. There lived also Wieland, Herder, and Schiller. The great academic philosophers—Kant, Fichte, Schelling, and Hegel—exercised, especially the two first named, a considerable influence upon the minds of their contemporaries, for instance Schiller. The great Weimar epoch was followed by the romantic school.

Here should be mentioned the brothers Jakob (1785-1863) and Wilhelm (1786-1859) Grimm, collectors and editors of the world-famous *Volks- und Haus-Märchen* and fosterers of ancient German mythology, language, and literature. But the most conspicuous figures in the generation which followed the death of Goethe were Heine, Gutzkow, and Fritz Reuter. Heine (1797-1856) won his greatest fame as a writer of lyrics (*Buch der Lieder, Nordseebilder*) in which mockery, pathos, and genuine humor are intermingled in an inimitable perfection of style. He also showed the same original genius, as well as matchless perfection of style, in the prose *Reisebilder*. Fritz Reuter (1810-74), one of Germany's greatest humorists, excelled as a story-teller (*Ut mine Stromtid, Ut de Franzosentid, Ut mine Festungsid*), but wrote in Platt-Deutsch, or Low German; and he also published good poetry (*Kein Hüsung, Hanne Nüte, Läuschen un Riemels*). Gutzkow (1811-78), the most important representative of the 'Young Germany school,' which subordinated literature to politics, distinguished himself as a dramatist (*Zopf und Schwert, Uriel Acosta*) and novelist (*Ritter vom Geist, Zauberer von Rom*).

Several writers belonging to no particular

school exercised more or less influence upon their contemporaries—the philosopher Schopenhauer (1788-1860), a strong, clear writer; the biographer Fr. D. Strauss (1808-74), author of *Leben Jesu*; the philosopher and theologian Schleiermacher (1768-1834); the educationists Herbart (1776-1841) and Froebel (1782-1852). The most distinguished names among the novelists of this period were the two Swiss, Gottfried Keller (1819-90) and C. F. Meyer (1825-98); and at a later date Freytag (1816-95) and Spielhagen (1829-1911). Paul Heyse (1830-1914), author of *Kinder der Welt, Im Paradiese, Himmlische und Liebe*, and a host of others, and Theodor Storm (1818-88) in *Immensee, Aquis Submersus, Der Schimmelreiter*, etc., excelled in the short story; both have written good verse as well.

During the closing years of the 19th century German literature, in every department, was more or less influenced by the naturalistic writers of France, Russia, Norway, and Sweden. The genre which was most successfully cultivated was the naturalistic drama and the naturalistic novel. Here the names of Sudermann (1857-1928), and Hauptmann (1862) stand out pre-eminent. The former showed his mastery of stage-craft in dramas of modern life (*Die Ehre, Heimat*) and other genres (*Johannes, Die drei Reihersfedern*), and also wrote novels (*Frau Sorge, Der Katzanstieg*). But Hauptmann, although he has written realistic plays (*Die Weber, Fuhrmann Henschel*), shows considerable poetic originality in the allegorical poem *Die versunkene Glocke*, and the *Mächen Drama of Hanneles Himmelfahrt*. Wagner's great music dramas also deserve notice here. One of the greatest influences which affected German literature in these years was the teaching (*Also sprach Zarathustra*) of the philosopher Nietzsche (1844-1900), the prophet of intellectual pride and the imperious character.

One of the most important poets of the naturalistic school was Richard Dehmel (1863-1920). He was one of a group which re-established a closer relation between German poetry and the spirit of the times, and much of their poetry concerned itself with social problems. Dehmel's most important works were: *Erlösungen, Aber die Liebe, Weib und Welt*, and *Zwei Menschen*. Thomas Mann (1875- ) is generally regarded as the leading novelist of this school. He also wrote essays of merit. His works include: *Die Buddenbrook, Tonio Kröger, Königliche Hoheit, Der Tod in Venedig, Unordnung und*

*frühes Leid, Der Zauberberg, Betrachtungen eines Unpolitischen, Bemühungen, and Rede und Antwort.*

Eventually a new school of thought arose in opposition to naturalism and materialism, representing a revival of romanticism and generally called the neo-romantic school. Its ideas were first formulated by Ricarda Huch, Oswald Spengler and Leopold Ziegler. It was strongly influenced by the ideas and writings of Friedrich Nietzsche, Richard Wagner, John Ruskin, Fedor Dostoevski, Charles Baudelaire, Paul Verlaine, Maurice Maeterlinck, Emile Verhaeren, Edgar Allen Poe, Walt Whitman, Oscar Wilde, and others. One of its earliest representatives in Germany was Frank Wedekind (1864-1918), with his *Frühlings Erwachen, Erdgeist, Kammersänger, and Marquis von Keith*. Gerhart Hauptmann, whose early dramas had been outstanding works of the realistic school, soon became one of the leading figures and influences amongst the neo-romanticists, with his *Die versunkene Glocke, Der arme Heinrich, Und Pippa tanzt, Griselda, Hanneles Himmelfahrt, Der weisse Heiland, Der Narr in Christo, Der Ketzer von Soana, Die Insel der grossen Mutter, Till Eulenspiegel, Indipohdi, and Wanda*. The greatest influence in the development of neo-romanticism, however, was Stefan George (1868-1933), with his poems and essays including *Die Bücher der Hirten und Preisgedichte, Das Jahr der Seele, Der siebente Ring, Der Teppich des Lebens und Die Lieder von Traum und Tod, Der Stern des Bundes, Der Krieg, Drei Gesänge, Das Neue Reich, Tage und Taten, and Maximin*. Other important creative artists amongst the neo-romanticists were: Hugo von Hofmannsthal (1874-1929); Rainer Maria Rilke (1875-1926); Ricarda Huch (1864- ); and Jakob Wassermann (1873-1934).

The World War, of course, exerted a powerful influence on German literature. It brought forth a tremendous crop of poems, many of which were of a very ephemeral nature. Of greater importance and more lasting value were some of the war novels, several of which enjoyed international success, especially Erich Maria Remarque's *Im Western nichts Neues (All Quiet on the Western Front)*, Arnold Zweig's *Der Streit um den Sergeanten Grischa*, and Josef Magnus Wehner's *Sieben vor Verdun*. The revolution, which so completely changed political and economic conditions in Germany, naturally was another event strongly influencing literature. It brought forth a number of talented

poets from the ranks of the workers. Foremost of these is Heinrich Lersch (1889- ), a boilermaker by trade, best known by his *Mensch im Eisen* and by other books of poems.

German drama became a fertile field for writers. Franz Werfel's *Juarez und Maximilian* appeared in New York at the Theater Guild. Bruno Franck's *10,000* was spectacular. Among the playwrights are Carl Sternheim and Alfred G. Nagel. In history Albert Soergel published his monumental study of contemporary German literature. Emil Ludwig's *Bismarck, Goethe, and Napoleon* are popular in America as well as in Germany. Von Bülow's *Memoirs* (1931) should be noted. The most important novels of the year (1933) were Thomas Mann's *Die Geschichten Jakobs*; Franz Werfel's *Die Vierzig Tagen des Musa Dag*; Rudolf Hans Bartsch's *Ein Deutscher*; and Karl B. von Mechow's *Vor-sommer*. Notable in the drama of 1933 is Gerhart Hauptmann's *Die Goldene Harfe*. Richard Strauss and Hugo von Hoffmannsthal produced the new opera of 1933, *Arabella*. Important books are *Mein Kampf*, Adolf Hitler's autobiography. Oswald Spengler's *Jahre der Entscheidung*. Consult C. von Klenze's *From Goethe to Hauptmann* (1926); H. Naumann's *Die Deutsche Dichtung der Gegenwart* (1927); Scherer-Walzel's *Geschichte der Deutschen Literatur* (1927); A. Bartels' *Geschichte der Deutschen Literatur* (3 vols. 1924-28); Soergel's *Dichtung und Dichter der Zeit* (1929); E. Engel's *Geschichte der Deutschen Literatur* (2 vols. 1929); W. Mahrholz's *Deutsche Literatur der Gegenwart* (1931); and J. G. Robertson's *History of German Literature* (1931).

**Germ-cells.** See **Biology; Embryology; Bacteria and Bacteriology; Genetics.**

**Germination** is the process whereby a plant emerges from the seed when the latter is placed under suitable conditions. As the internal parts of the seed begin to swell, the pericarp splits and allows the radicle to protrude and descend, and the cotyledons to ascend, with (in the case of dicotyledons) the plumule between them.

**Gérôme, Jean Léon** (1824-1904), French painter and sculptor. He gained a great reputation as painter of Oriental and dramatic subjects, which show fine observation, precise drawing, and elaborate finish. He is one of the most refined of the Neo-Greek school, of which he is the head. Among his best-known pictures are *The Duel after the Ball* (1857); *The Slave-Market* (1867); *The La-*

*dies of the Harem out for a Drive* (1869); *The Age of Augustus*; *Ave, Cæsar morituri te salutant*; *Louis XIV. and Molière*; and *Napoleon III. receiving the Siamese Ambassadors*. Among his paintings in the U. S. are his *Abyssinian Chief* and *Sheik at Devotions* in the Wolfe collection at the Metropolitan Museum, New York; *Louis XIV. and the Grand Condé*, in a private collection in New York. See Cook's *Art and Artists of Our Time*, vol. 1.

**Gerona** (ancient *Gerunda*), town, cap. of prov. Gerona, Spain. It is one of the oldest cities in Spain and still retains a mediæval aspect, though the suburb of El Mercadel is modern. Its chief architectural features are its churches, especially the fine 15th-century cathedral. Gerona is famous for its heroic defence against the French in 1809; p. 20,545.

**Geronimo** (d. 1909), North American Indian chief, of the Chiricahua tribe of Apaches. During 1884 and 1885 he, at the head of his 'hostiles,' revolted against the whites of the southwest, especially in Arizona. The United States forces succeeded in obtaining from him an agreement to surrender on condition that his band and their families should for two years reside in the East, and be returned to their reservation. But before negotiations were complete, the chief and his followers escaped to the mountains, from which they were driven by an almost unprecedented campaign of unbroken pursuit and harassment. At last they gave up exhausted and Geronimo obtained a modification of his terms. He and his subordinates were removed to St. Augustine, then to Fort Pickens, and subsequently to Fort Sill, Okla.

**Gerry, Elbridge** (1744-1814), American statesman, born at Marblehead, Mass. He signed the Declaration of Independence, was chairman of the Committee on Treasury, was a member of the convention which adopted the Constitution, but refused to sign on the ground that the rights of the people were not sufficiently protected. During his administration as governor of Massachusetts the attempt of the Republican majority of the legislature to redistrict the state to the disadvantage of the Federalists was attributed to his influence. Because of the shape of one of the districts suggesting some fabulous animal the term 'gerrymander' was coined, to indicate an unfair arrangement of electoral districts, designed to give one party an advantage. In 1812 he was elected Vice-President of the United States and held that office at his death. See Austin's *Life* (1828-29).

**Gerry, Elbridge Thomas** (1837-1927), American lawyer and humanitarian, grandson of Elbridge Gerry. He began his connection with humanitarian societies in 1870 as counsel for the Society for the Prevention of Cruelty to Animals, and was a founder of the Society for the Prevention of Cruelty to Children in 1874.

**Gershwin, George** (1898-1937), American composer, born in New York City. His work was chiefly of the musical comedy type, including the music for George White's *Scandals* (1920-24); *Lady Be Good* (1924); *Strike Up the Band* (1927); *Girl Crazy* (1930); and *Of Thee I Sing* (Pulitzer Prize, 1930). He also wrote many songs and some orchestral works, the latter including the well-known *Rhapsody in Blue* (1923), for orchestra and piano.

**Gerson, Jean Charlier de** (1363-1429). French divine, born of peasant parents. He was elected chancellor of the University of Paris in 1395, and used his great influence in endeavoring to purify the lives of the clergy, and in the universities he strove to supplant the scholastic theology by a more rational and evangelical type of religious thought. A scholar and a mystic, he endeavored to show the unity of these points of view in his *Considerationes de Mystica Theologia Speculativa et Practica*. His famous work, *De Consolatione Theologiae*, was written during his exile in Tyrol. His *Opera* were published in 3 vols. at Basel in 1518.

**Gertrude, St.** (1256-c. 1303), German mystical writer, lived in the convent at Helfta, near Eisleben. *Exercises of St. Gertrude* (Eng. trans. 1863) is famous in mystic theology. See Ledos's *Sainte Gertrude* (1901), which analyzes the current confusion of St. Gertrude with the abbess of the same name.

**Gervase of Canterbury** (?1141-c. 1210), an English Benedictine monk, who wrote an account of the burning and rebuilding of Canterbury Cathedral, also *Actus Archiepiscoporum Cantuariensium* (ed. Stubbs, Rolls Series, 1879-80). He compiled a *Mappa Mundi*, containing a topographical description of England.

**Gervase of Tilbury** (d. 1235), English historical writer, composed the *Otia Imperialia* (c. 1212), which included a summarized history of the world from the creation, as well as a collection of curious legends and beliefs. The *Liber Facietiarum*, or 'Book of Anecdotes,' was compiled for Henry II. of England. The *Otia* was printed by Leibnitz in *Scriptores Brunsvicensis*, vol. 1. (1707-10).

**Gervex, Henri** (1852-1929), French painter. His first success was *Bacchantes and Satyr*, (1874). His pictures of everyday life are marked by a vigorous realism. Among his best works are *Communion à l'Eglise de la Trinité* (1877); *Les Anatomistes* (1897); the *Hanging Committee of the Salon* (1885), in the Luxembourg; *Before the Surgical Operation* (1887); and a portrait of *Waldeck-Rousseau* (1900).

**Gervinus, Georg Gottfried** (1805-71), German historian. His *Geschichte des Neunzehnten Jahrhunderts* (8 vols. 1856-66) was preceded by an *Einleitung in die Geschichte des Neunzehnten Jahrhunderts* (1853), the strongly democratic tendency of which led to the author's prosecution and imprisonment. Foiled in his political efforts in the cause of German unity and advancement, Gervinus devoted himself entirely to literary work. Here belong his *Shakespeare* (1849-52), once a classic among Shakespearean commentaries, and *Händel und Shakespeare. Zur Aesthetik der Tonkunst* (1868). His *Geschichte der Deutschen Dichtung* was the first comprehensive survey of the course of German poetry in connection with contemporary influences.

**Gesenius, Friedrich Heinrich Wilhelm** (1786-1842). German Orientalist and Biblical critic, is chiefly remembered for his works on Oriental philology and Old Testament criticism, among these being the great *Thesaurus Philologicus-Criticus Linguae Hebraicae et Chaldaicae Veteris Testamenti* (1829-42). His Hebrew dictionary and grammar are still standard books of reference.

**Gesner, Abraham** (1797-1864), Canadian geologist, was commissioned in 1838 to investigate the geological and ethnological features of the Canadian lower provinces. From experiments with Trinidad asphalt Gesner succeeded in obtaining an illuminating oil from that substance in 1851, and shortly afterward he first secured by distillation from soft coal, the oil named by him 'kerosene,' a name subsequently used generally for mineral oils. Gesner wrote works on the geology and resources of Nova Scotia and New Brunswick, and *A Practical Treatise on Coal, Petroleum, and other Distilled Oils* (1860).

**Gesner, Konrad von** (1516-65), Swiss naturalist. During his brief life he published 72 works and left behind 18 others in progress. His *Historia Animalium*, an encyclopedia of all known animals, is regarded as the foundation of modern Zoölogy.

**Gesso**, a mode of mural decoration in which the painting is done on a prepared

ground or surface of stucco or plaster of Paris.

**Gest, Morris** (1881-1942), Russian theatrical impresario distinguished for his presentation in America of such spectacles as *Chu Chin Chow*, and *The Miracle*. Eleanor Duse visited the United States under his management in 1923.

**Gestalt Psychology** is that psychology which has regard to organized psychophysiological wholes or totalities in the description of the behavior phenomena that make up psychology. The German word *Gestalt* means *form*, and it indicates that *Gestalten* are organizations or patterns, or structures, which is historically the older conception. It has become clear that a structure has meaning only in respect of a whole; a structure is an organized relation among parts, and thus in *Gestalt* psychology the emphasis shifts to the whole from its parts. *Gestalt* psychology began in Germany as a reaction away from the older psychology of mental elements. It became apparent that most psychological phenomena cannot be adequately described by a mere enumeration of mental elements. Von Ehrenfels propounded the doctrine of form-qualities—*Gestaltqualitäten*, in 1890. He pointed out, for instance, that a melody is something more than a mere succession of notes. Not only does the melody depend on the relationships between the notes, but also it depends upon nothing but these relationships, since other notes in the same relation to each other give the same melody. Melodic form is thus a function of the whole and not of its parts—the individual notes. The school of *Gestalt* psychology may be dated from the publication by Wertheimer in 1912 of an experimental article on the visual perception of movement. He showed that perceived movement is not a mere change of space in time, but a conscious event that depends upon the spatial-temporal relations between parts of a whole. Koffka further developed the concept of *Gestalt* as applied to the experimental psychology of perception, and Köhler applied the same principle in his study of the behavior of apes. Later Köhler undertook to show that the principles of *Gestalt* theory are just as important for physics and biology as for psychology, and the doctrine entered upon a broader phase of its existence. Its greatest contributions have been to the problems of perception. Recently, however, Lewin has been applying the principles extensively to the study of human behavior, especially to that of children. If the child and the various elements of his environment be consid-

ered as parts of a whole, then the behavior of the child can be understood.

Consult W. Köhler, *Gestalt Psychology* (1929) and *The Mentality of Apes* (1925); K. Lewin, in Murchison's *Handbook of Child Psychology* (1931); R. S. Woodworth, *Contemporary Schools of Psychology* (1931); E. G. Boring, *History of Experimental Psychology* (1929).

**Gestapo** (from *Geheime Staats Polizei*), the secret police of Nazi Germany.

**Gesta Romanorum** ('the deeds of the Romans'), the title of a collection of short stories and legends, in the Latin tongue, widely spread during the Middle Ages, of the authorship of which little is known. The title is only so far descriptive as the nucleus of the collection consists of stories from Roman history, or rather pieces from Roman writers, not necessarily of any greater historical value than that of 'Androcles and the Lion' from Aulus Gellius. Moralized, mystical and religious tales, as well as other pieces, many of ultimate Oriental origin, were afterward added, bringing the whole to about 180 chapters. The modern form of the *Gesta Romanorum* is a collection of 181 stories, first printed about 1473, but no MS. corresponding exactly to which now exists. The first printed edition was issued at Utrecht in 150 chapters; the second, forming the standard text, with 181 chapters, at Cologne—both between 1472 and 1475. An edition in English was printed by Wynkyn de Worde (1510-15), from MSS. differing widely from those reproduced in the early printed Latin versions. The striking diversity between the MSS. in England and the printed collections led Douce to believe that there were two distinct collections of stories, one of German, the other of English origin. An English version was printed in two volumes in 1824 (new ed. 1905).

**Gestation**, is the term applied to the bearing of young in the womb from the time of conception to that of delivery. The period varies considerably in different species of mammals, and to a less degree in different individuals of the same species. In woman the average length of gestation is about 280 days, but may be more or less. Variations in the duration of pregnancy have important legal aspects. French law recognizes as legitimate a child born six months after marriage. The same law assumes the possibility of gestation occupying 300 days. American legislators have recognized a gestation of 317 days. Among the lower animals those which are

uniparous have, as a rule, comparatively lengthy gestation. Thus the elephant carries her young almost two years, the cow nine months, the mare eleven months, and the sheep twenty-one weeks. Among animals which bring forth litters the period of gestation is shorter—the bitch carrying her young sixty-two days, the rabbit about five weeks, and the rat about four weeks.

**Getæ**, a Thracian people who in the middle of the 4th century B.C. crossed the Danube and settled in Transylvania and Wallachia. During the first half of the first century B.C. they became politically united with the Dacians, a cognate race who had settled in their territories. In 106 A.D. the Dacians and Getæ were subdued by Trajan, their country being added to the Roman Empire.

**Gethsemane**, a place near Jerusalem, the scene of our Lord's agony on the night preceding his crucifixion. It was on the slopes of the Mount of Olives. The garden is identified with a square enclosure just across the Kedron from St. Stephen's gate, but recent explorers think this too near the city.

**Gettysburg**, borough, Pennsylvania co. It is the seat of Pennsylvania College and Lutheran Theological Seminary. The town was settled in 1786. Here was fought the Battle of Gettysburg between the Federals and the Confederates in the Civil War. The battlefield, now a national park, has numerous monuments commemorating the battle; and in the National Cemetery is an elaborate monument of granite; p. 5916.

**Gettysburg Address**, delivered by President Lincoln at the dedication of the Battlefield of Gettysburg as a soldiers' cemetery, Nov. 19, 1863, has become a classic in the oratory of the world. The text is as follows:

'Fourscore and seven years ago our fathers brought forth on this continent a new nation conceived in liberty and dedicated to the proposition that all men are created equal. Now we are engaged in a great civil war, testing whether that nation, or any nation so conceived and so dedicated, can long endure. We are met on a great battlefield of that war. We have come to dedicate a portion of that field as a final resting place for those who here gave their lives that that nation might live. It is altogether fitting and proper that we should do this. But, in a larger sense, we cannot dedicate, we cannot consecrate, we cannot hallow this ground. The brave men, living and dead, who struggled here have consecrated it far above our poor power to

add or detract. The world will little note nor long remember what we say here, but it can never forget what they did here. It is for us, the living, rather to be dedicated here to the unfinished work which they who fought here have thus far so nobly advanced. It is rather for us to be here dedicated to the great task remaining before us—that from these honored dead we take increased devotion to that cause for which they gave the last full measure of devotion; that we here highly resolve that these dead shall not have died in vain, that this nation under God shall have a new birth of freedom, and that government of the people, by the people, for the people, shall not perish from the earth.'

**Gettysburg, Battle of**, the decisive battle of the American Civil War, was fought on July 1, 2, and 3, 1863, at Gettysburg, Pa., between the Federal Army of the Potomac, under Gen. George G. Meade, and the Confederate Army of Northern Virginia, under Gen. Robert E. Lee, and ended in a victory for the North. The battle came at a critical time in the fortunes of both the North and the South, the Federal arms having recently suffered a severe defeat at Chancellorsville, while a Southern army was being besieged by Grant at Vicksburg.

For a month after the Battle of Chancellorsville, Lee and the Federal General Hooker occupied positions on opposite sides of the Rappahannock at and near Fredericksburg. During this time Lee reorganized his army and determined upon a second invasion of the North, based partly on the hope that it would compel the withdrawal of Grant's forces from before Vicksburg in order to protect the cities of Washington, Baltimore, and Philadelphia, and partly on the fact that the flourishing fields and towns of Pennsylvania would yield the supplies of food and clothing his army needed so badly. On June 3 Lee's entire force, estimated at 75,000 men, began the advance from Fredericksburg, moving along the Rappahannock. Meade planned to fight a defensive battle along the line of Pipe Creek, while Lee planned to fight a defensive battle at Cashtown. On July 1, however, the battle between the two armies was precipitated on a field which neither Lee nor Meade would have chosen.

The town of Gettysburg lies 7 m. from the Maryland border. It is the converging point of eight roads along which troops could be easily moved. The village occupied the center of the field of battle, which included an area of about 25 sq. m. The fighting on the

first day raged w. and n. of Gettysburg, the Confederates finally driving back the Federals who then took up a strong position along Cemetery Hill, s. of Gettysburg, and both Meade and Lee brought forward their main armies.

At 4 p. m. of July 2, Longstreet vigorously attacked the Federal left, gaining ground, though his success was only partial and the Federal line was not broken. About sunset Ewell attacked, even more vigorously, the Federal right, and succeeded, after desperate fighting, prolonged into the night, in effecting a lodgment within the Federal lines. From this advanced position on their left, however, the Confederates were driven back on the following morning. The second day thus closed with the advantage in favor of the Federal army. On the third day, Lee decided to assault the Union center. At 1 p. m. a terrific cannonading was opened by the Confederates, who centered the fire on Cemetery Ridge; and this was answered by the Federal artillery. At the end of half an hour the latter ceased firing, in order to save ammunition and cool the guns in preparation for the anticipated Confederate attack. Believing that the Union ammunition had been exhausted, Lee ordered the advance. Then suddenly the Union guns thundered forth again, but unflinchingly the Confederate soldiers advanced. They were overwhelmed, and driven from the field, slain, or captured. The tide of battle had turned, and General Lee began his retreat the following night. The second invasion of the North was thus brought to a close, and thereafter the cause of the Confederacy became a losing one.

Consult Doubleday's *Chancellorsville and Gettysburg*; Longstreet's *From Manassas to Appomattox*; Swinton's *Twelve Decisive Battles of the War*; Battine's *The Crisis of the Confederacy—a History of Gettysburg and the Wilderness*; Young's *The Battle of Gettysburg* (1913).

**Geum**, a genus of hardy plants (Rosaceæ). They are of decorative value, their five-parted flowers being borne singly at the ends of the much-branching stems. Among the commonest species are the yellow *G. strictum*, and *G. vernum*, both found in shady, damp places.

**Gevaert, Françoise Auguste** (1828-1908), Belgian musical composer and musical historian, born at Huyssse. He composed many operas: among others, *Georgette* (1853), *Quentin Durward* (1858). He was equally distinguished as a writer on music,

and published *Histoire et Théorie de la Musique de l'Antiquité* 2 vols. (1875-81); *Nouveau Traité d'Instrumentation* (1886); and he edited *Les Gloires de l'Italie* (1868) a collection of Italian songs of the 17th and 18th centuries; and *Chansons du XV<sup>e</sup> Siècle* (1875).

**Geyser**, a fountain of hot water which intermittently gushes up to a great height. Geysers are almost confined to Yellowstone Park, Iceland, and New Zealand, three volcanic regions; and they are commonest in the Yellowstone region. A geyser consists of a basin and a tube. The basin is formed above ground by the deposits precipitated as the water evaporates, and often becoming like a crater. The tube leads beneath the surface, and in it, or in its expansions, water accumulates, is gradually heated until the pressure of the super-



'Old Faithful' Geyser, Yellowstone Park.

incumbent water is overcome by that of the steam generated nearer the source of heat, and a column of hot water is projected through the tube high into the air, falling into and around the basin. The source of heat is probably uncooled lava, but it probably gradually cools, for geyser eruptions tend to diminish in frequency and regularity, and finally to cease.

**Gezer**, a city of Dan, Palestine, in the low hills, w. of the Jerusalem mountains, given up by Egypt to Solomon. The excavations carried on by the Palestine Exploration Fund revealed five main epochs in its history.

**Gharial**. See **Gavial**.

**Ghasel**, or **Ghazal**, in Persian lyric poetry, a form of short ode of from five to sixteen couplets, the second lines of which are set to one rhyme, the poet's pen name being frequently introduced into the last couplet. It was used for love songs, aspirational hymns, etc.

**Ghats**, or **Ghauts**, two ranges of mountains, the eastern and western, of Southern India. The western range, starting from the Tapti Valley, hugs the shore in a precipitous and almost unbroken ramp of trap rocks at an elevation of from 3,000 to 7,000 ft. The Eastern Ghats, more broken, have an average elevation of 1,500 ft., and traverse the Madras Presidency, starting from its n.e. extremity.

**Ghazali**, or **Ghazzali**, **Abu Hamid Mohammed ibn-Ahmed El**, Arabian philosopher (1058-1111), commonly known as **Algazel**, was born at Tus, in Khorassan. Ghazali represents the skeptical, or rather the critical side of Arabian philosophy, for in his quest after truth he was led to examine, and to some extent to doubt, the accepted metaphysical teachings of the Arabian exponents of Aristotelianism. His principal work, *The Overthrow of the Philosophers*, may be found in the Latin translation of Averroës's *Opera* (eds. 1472, 1552). The introduction to it, known as *Logica et Philosophia Algazelis Arabis*, is a general exposition of Arabian Aristotelian philosophy.

**Ghazipur**, chief tn. of Ghazipur dist., United Provs., India, on l. b. of Ganges. It contains the ruins of the palace of Forty Pillars, and a marble statue of Lord Cornwallis, who died here in 1805. Ghazipur is the headquarters of the opium department, and manufactures rose-water and attar of roses; p. 39,429.

**Ghaznevids**, an Uzbek dynasty founded by a slave, **Alpteghin** of Bokhara, at Ghazni, in 692. His immediate successors, **Sebukteghin**, 976-998, and **Mahmud**, 998-1030, more especially the latter, extended their sway over Kabul, Peshawar, and Lahore on the n. and e., and as far as Bagdad and the Caspian on the w. and n.w. The dynasty lasted until 1184, although its power was overthrown by the ruling sovereign of Ghur in 1152.

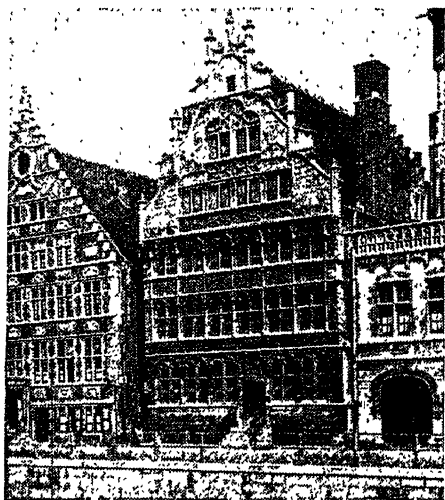
**Ghazni**, **Ghuznee**, or **Gazna**, fortified town, Afghanistan, on the Ghazni River. It has a good caravan trade in fruit and wool. On July 21, 1819, the fortress capitulated to the British; and in 1842 General Nott stormed the fort and razed it to the ground.



**Ghebers.** See **Parsees**.

**Gheel**, town, Belgium, in the province of Antwerp. It is chiefly noted for the fact that since the 13th century insane persons have been here 'boarded out' with heads of families, by whom they are employed and controlled; p. 17,018. See **LUNACY**.

**Ghent**, city, Belgium, chief town of the province of East Flanders, at the confluence of the Scheldt and Lys. A canal connected with the Wester Scheldt, allows sea-going vessels to reach the city. Its cathedral, dating from the 10th century, contains a notable altar by the Van Eycks, a famous picture by



*Ghent: The Guild House.*

Rubens, and a good carved pulpit. The belfry with its chime of 44 bells, the fine Gothic town hall, the Counts' Castle, the provincial archives in the Geeraard-Duivelsteen, the great Friday market abounding with historical associations, the Institute of Sciences, the law courts, 1836-44, and some ancient churches are the principal features of the center of the city. Outside the ancient city proper lie the Archæological Museum, 1884, and Picture Gallery, the Great Béguinage or convent of the Béguines, the ruins of the ancient abbey of St. Bavon, the Little Béguinage, the Citadel Park, and the botanical and zoölogical gardens. Ghent is the seat of a university founded in 1817, but since 1834 a peculiarly Flemish institution, and now attended by some 500 students. It is a manufacturing center, and produces cottons and linens, lace, sugar, machinery, iron, and leather work,

and grows azaleas, camellias, and other green house plants for export; p. 165,287.

The history of Ghent is distinguished by two periods of special prosperity—the first, in the middle of the 14th century, when its fortunes were guided by Jan van Artevelde and his son Philip, and it was a powerful ally of Edward III. of England; and the second, under the favor of the Emperor Charles V., who was born within its walls, 1500. At the latter period it numbered some 200,000 inhabitants; but its prosperity was destroyed by Charles himself, 1540, by the Spaniards under Alva, 1567, and by Alexander Farnese, 1584. In 1706 it was occupied by Marlborough; and in 1814 peace was signed in the city between England and the United States.

**Ghent, Treaty of**, the treaty between the United States and Great Britain by which the War of 1812 was brought to a close. It was negotiated at Ghent, Belgium, by J. Q. Adams, J. A. Bayard, Henry Clay, Jonathan Russell, and Albert Gallatin, representing the United States, and Lord Gambier, Henry Goulburn, and William Adams, representing Great Britain, and was signed on Dec. 24, 1814, ratifications being exchanged at Washington on Feb. 17, 1815. The text of the treaty may be found in Davis (ed.), *Treaties and Conventions of the United States*. Consult Adams' *History of the United States from 1801-17*.

**Ghetto**, in the Middle Ages, the Jews' quarter of a large town, outside of which they were not permitted to take up residence. The name is now given to any section of a large city occupied by Jews of the poorer classes. The ghetto system originated in Rome under the papacy. American cities have their distinctive Jewish quarters. The New York ghetto, the 'East Side,' is generally considered to be that section of the city bounded by the Bowery, Houston Street, and the East River, though as a matter of fact the population to the e. of Broadway as far n. as Fourteenth Street is predominantly Jewish, while very large colonies are to be found in Harlem e. of Lenox Avenue, in the borough of the Bronx, and at Brownsville, in the eastern outskirts of Brooklyn.

**Ghi**, or **Ghee**, clarified butter, used dietetically, medicinally, and ceremonially by Indian and Singhalese natives, is prepared by melting butter from cow's or buffalo's milk, and separating the curd and water.

**Ghibelline**. A member of a political faction in Italy in the later Middle Ages. See **Guelf** and **Ghibelline**.

**Ghiberti, Lorenza** (1378-1455). Italian worker in bronze, architect, and painter, born in Florence. In 1400 he fled from the plague in Florence, and painted frescoes in the palace at Rimini. Returning to Florence, he was commissioned to design the bronze doors of the baptistery. These doors show a marked development in the art of sculpture since the days of the Pisani, in suavity of line and naturalness of figure. In 1417 he executed reliefs for the font at Siena. His great masterpiece, the second bronze doors of the baptistery, a series of panels treating the Old Testament history, was commenced in 1425 and completed in 1452. He also executed many commissions for monuments in San Michele, Santa Croce, Santa Maria Novello, the cathedral, and elsewhere.

**Ghika, Jon** (1817-97), Roumanian statesman, born at Bucharest; took a leading part in preparing the revolution of 1848 in Wallachia. The Sultan in 1856 made him prince of Samos. Ghika became, 1866, president of the council and minister of foreign affairs in the provisional government. Under the new constitution he was twice prime minister. From 1881 to 1890 he was Roumanian minister in London. Of his writings, the best known are: *Convorbiri Economice* (1866-73); *Memories of Exile* (1890); he translated several of Shakespeare's dramas into Roumanian.

**Ghilan.** See **Gilan**.

**Ghilzai**, a Pathan tribe of S.E. and N.W. Afghanistan; a tall, stalwart race of shepherds and farmers, cruel, and suspicious of strangers. They speak the Afghan language. According to their own tradition they are of Turkish origin.

**Ghirlandajo**, a family of Florentine artists (1.) DOMENICO DI TOMMASO CORRADI DI BIGORDI (1449-94) surnamed IL GHIRLANDAJO, or the Garland-maker. His masterpieces are the Sassetti Chapel in Santa Trinità and the choir of Santa Maria Novella, Florence. (2.) RIDOLFO (1483-1561), son of Domenico, became as noted in easel as his father was in mural painting. Raphael intrusted drapery to him. His best pictures are at Florence, St. Petersburg, and Berlin.

**Ghorkhar**, or **Onager**, the variety of Asiatic wild ass which is found in northwestern India and Beluchistan.

**Ghost-moths** are members of the family Hepialidæ, remarkable for their pale colors.

**Ghosts.** See **Psychical Research**.

**Ghur**, a region of Asia, near Herat in Afghanistan, stretching towards Kandahar, co-

incident in part with ancient Paropamisus.

**Ghurkas**, a race of hardy mountaineers in Nepal, who, of Rajput descent, acquired sovereignty, 1767-8, over the aboriginal inhabitants of the country. The East India Company came into collision with them, and in 1816 obtained possession of the southern slopes of the Himalayas but consented to recognize the independence of Nepal. The Ghurkas, enlisting in the British Indian army, proved loyal in the Mutiny, and since then have given proof of their valor in other conflicts on the Indian frontier.

**G I**, Government Issue, a term applied in World War II to materials supplied to the armed services. The '**G I Bill of Rights**,' which was enacted by Congress in 1944, provided aid to veterans in hospitalization, education and vocational training, unemployment compensation, and loans for the purchase of homes and business property. Men in the services were known as '**G I Joes**.'

**Giannone, Pietro** (1676-1748), Neapolitan historian, was a native of Ischitella, Capitanata. While practising law at Naples he composed his great history *Storia Civile del Regno di Napoli*, published in 1723 (Eng. trans. 1729-31). His *Anecdotes Ecclesiastiques* (1738) were republished in *Opere Postume* (1760); his later works appeared as *Opere Inedite* (ed. Mancini, 1859). See *Life* in Italian, by Panzini (1821), and Pierantoni's *Autobiografia di P. Giannone* (1890).

**Giants**. 'Giantism,' regarded as a disease, is closely connected with the disease known as acromegaly which some think is caused by a certain morbid process, an excessive development of the anterior lobe of the pituitary body. When this condition does not become active until after the age of twenty-five, the result is acromegaly; if it appears in early youth, then the whole of the limbs are affected, and the stature becomes gigantic.

**Giant's Causeway**, a remarkable group of basaltic rocks on the north coast of Co. Antrim, Ireland, 8 m. e.n.e. of Portrush. It consists of a vast number of columns, generally pentagonal or hexagonal. The causeway proper is a low promontory formed of closely packed columns. Altogether there are about forty thousand pillars, fitting into each other most perfectly, and jointed horizontally. The peculiar columnar structure of the causeway rocks is shown by geologists to result from the contraction in cooling of the lava of which they are composed. The Giant's Causeway derives its name from the legend which ascribes its construction to Finn M'?

Coul or Fingal, who bridged the channel between Ireland and Scotland, in order that the giants might pass from Antrim to Staffa.



*Giant's Causeway.*

**Giants' Kettles** are deep pot-shaped holes found in Scandinavia, N. Germany, Switzerland, etc., and the United States. It is supposed that they are due to water flowing in the great ice-sheets of the Ice Age falling down a crack or crevasse and boring out the rock beneath by the force of its direct impact, and the grinding effect of the stones and sand it carried with it. They are known also to be formed in swirling eddies of rapids in streams. The most remarkable group of kettles in America and probably in the world are at Taylor's Falls, Minn., on the St. Croix River.

**Giaour** ('unbeliever') is the English form of a word used by the Turks to denote an adherent to any religion except the Mohammedan, but more particularly a Christian.

**Gibbet**, originally synonymous with gallows. Later it came to mean an upright post with projecting arm, from which the bodies of criminals were hung in chains after execu-

tion. The last instance of the practice was in 1839. See Hartshorne's *Hanging in Chains* (1891).

**Gibbon** (*Hyllobates*), the least specialized and the smallest of the four living types of anthropoid apes, is found in the Malay Peninsula and its vicinity. The largest does not exceed three feet in height, and when standing upright, the animals can touch the ground with their fingers. The face is more like that of man than are those of the chimpanzee and gorilla, but the tusks are long and prominent. See H. O. Forbes's *Handbook to the Primates* (1894) and E. Ingersoll's *Life of Mammals* (1906).



*Hoolock Gibbon.*

**Gibbon, Edward** (1737-94), English historian, was born at Putney. At Oxford his reading took a theological turn; he studied Bossuet's *Histoire des Variations*, and resolved to profess himself a Roman Catholic. When this became known, his father took him from Oxford and placed him at Lausanne under the roof and tuition of M. Pavilliard, a Calvinist minister.

The five years of Gibbon's life (July, 1753, to April, 1758) which he passed in Switzerland were without doubt the most important for forming the character of the future historian. It is evident that the years spent at Lausanne gave the needed thoroughness and stability to the fabric of Gibbon's mental endowment, especially in his study of the classics. He entirely renounced his connection with the Roman Catholic Church, and conformed outwardly to the Protestant worship. It was during his residence in Switzerland that he fell in love with Mademoiselle Susanne Curchod, but on his return to England he was commanded by his father to renounce all

thoughts of this strange alliance. In his own oft-quoted words, 'I sighed as a lover, I obeyed as a son.'

In the year 1761 Gibbon published his first book, a modest little volume in French entitled *Essai sur l'Etude de la Littérature*. At the close of the Seven Years' War he began the long-anticipated pleasure of the 'grand tour.' He was absent for two years and a half and the thirteen months which he spent in Italy were the most fateful for the determination of his future career. 'It was,' he says, 'the view of Italy and Rome which determined my choice of a subject.' But eight years elapsed after his return to England before he first put pen to paper to write the *Decline and Fall*. Five years of reading were followed by three years of writing, and in February, 1776, the first quarto volume of the *History of the Decline and Fall of the Roman Empire* was given to the world. 'The first impression of one thousand was exhausted in a few days; a second and third edition were scarcely adequate to the demand.'

At the time of the publication of his first volume Gibbon had already been for more than a year a member of Parliament. His parliamentary career, as member first for Liskeard and then for Lymington, lasted almost continuously from September, 1774, till September, 1783. He then threw up his seat in Parliament, and decided to seek once more the economical atmosphere of Lausanne. It should be mentioned that he had in the meantime (1781) published two more volumes of his *History*, bringing the work down to the fall of the empire in the West. In Lausanne he wrote the three concluding volumes of the great history, between 1783 and 1787. With the completion of the *Decline and Fall*, the interest in Gibbon's life comes to an end. His *Autobiography* closes in 1789, but he continued to reside at Lausanne till 1793, when, owing to the disturbed state of the Continent, he hastened back to his native land. Seven months after his return he died at the house of his friend, Lord Sheffield (Jan. 16, 1794).

**Gibbon, John** (1827-96), American soldier, was born in Holmesburg, Pa. He commanded a division of the Army of the Potomac at the battle of Fredericksburg, December, 1862, where he was wounded, and again at Gettysburg in the following July. From June, 1864, to April, 1865, he was in front of Petersburg, where he carried two redoubts in the final assaults. He was one of the commissioners to carry out the details of Lee's surrender. In March, 1865, his services were

recognized by his brevet appointment as brigadier- and major-general of the regular army. He was in charge of the expedition against Sitting Bull and in August, 1877, during a campaign against the Nez Percés Indians at the battle of Big Hole Pass, Montana, he was again wounded.

**Gibbons, Floyd** (1887-1939), famous war correspondent, radio commentator, and author. He first achieved fame when he reported Pancho Villa's raid on Columbus, N.M., 1916; was London correspondent for Chicago Tribune, 1917, and was on the S. S. Laconia which was sunk by a German submarine; reported the World War, losing an eye at the battle of Chateau-Thierry; director of Chicago Tribune's European office, 1918-27; later covered wars in all parts of the world for International News Service, also engaging in radio and motion picture work. He had been living quietly on his farm near Stroudsburg, Pa., but was preparing to cover the European War when death came. He wrote *The Red Napoleon*.

**Gibbons, Grinling** (1648-1720), English wood carver of Dutch parentage, was born in Rotterdam. He was employed by Christopher Wren at Windsor, St. James, Piccadilly, and St. Paul's Cathedral; the Reredos at St. James and the choir stalls of St. Paul's being particularly fine specimens of his carving.

**Gibbons, James, Cardinal** (1834-1921), American Roman Catholic prelate, was born in Baltimore, Md. He received his early education in Ireland, entered St. Charles College, Md., in 1855, was transferred to St. Mary's Seminary, Baltimore, in 1857, and after completing his course was ordained priest (1861). He was assistant chancellor of the Second Plenary Council of the Roman Catholic Church at Baltimore in 1866, and two years later was consecrated Vicar Apostolic of North Carolina, with the rank of bishop. In 1872 he was made bishop of Richmond, Va., and five years later was installed as coadjutor archbishop of Baltimore, succeeding to the archbishopric, and the title 'Primate of the United States,' the same year (1877). He was a delegate to Rome, in 1883, in connection with the perfection of plans for the third American Plenary Council of 1884, over which he presided, and soon after he was nominated as cardinal of the Roman Catholic Church.

On Sept. 13, 1908, he preached the formal sermon at the great Eucharistic Congress in London. In October, 1918, his golden jubilee,

commemorating a half-century episcopate was celebrated. In the same year the French government conferred upon him the decoration of the Legion of Honor. The ability of Cardinal Gibbons as an organizer and executive was equaled only by his unpretentious manner and simple method of living. His publications include: *The Faith of Our Fathers* (1871); *Our Christian Heritage* (1889); *The Ambassador of Christ* (1896); *A Retrospect of Fifty Years* (1917).

**Gibbons, James Sloan** (1810-92), American financier and philanthropist, was born in Wilmington, Del., of Quaker descent. His popular war song, 'We are Coming Father Abraham, Three Hundred Thousand Strong', was published in the N. Y. *Evening Post* of July 16, 1862. Among other books on financial subjects, he wrote *The Banks of New York* (1859).

**Gibbons, Orlando** (1853-1925), English musical composer and organist, was born in Cambridge, and lived chiefly in London. He was organist of the Chapel Royal and of Westminster Abbey. His madrigals, anthems, and hymns are masterpieces of their kind.

**Gibbs, Alfred** (1823-68), American soldier, was born in Sunswick, L. I. He served in the Mexican War under Gen. Scott. In 1848 he was appointed aide-de-camp to Gen. Persifor F. Smith in Mexico, California, and Texas, and in May, 1861, served at Albuquerque, N. M. He was made a brigadier-general of volunteers Nov., 1864, and helped to bring about Lee's surrender.

**Gibbs, Josiah Willard** (1839-1903), American mathematical physicist, born New Haven, Conn. He was called the father of physical chemistry. Consult *Collected Works* (1928); Rukeyser's *Willard Gibbs* (1943).

**Gibbs, Sir Philip** (1877- ), British editor and novelist. He was war correspondent with the Bulgarian army in 1912, with the French and Belgian armies in 1914, and with the British army in France and Flanders in 1915-18. He was knighted in 1920. His works include: *Founders of the Empire* (1899); *Facts and Ideas* (1905); *Men and Women of the French Revolution* (1906); *Adventures of War with Cross and Crescent* (1912); *The Battles of the Somme* (1917); *Now It Can Be Told* (1920); *People of Destiny* (1920); *Realities of War* (1920); *Back to Life* (1921); *The Day After Tomorrow* (1928); *The Cross of Peace* (1933); *Sons of the Others* (1941).

**Gibbs, (Oliver) Wolcott** (1822-1908), American educator and chemist, son of George Gibbs, a noted mineralogist, was born in New

York City. In 1863 has was elected Rumford professor of chemistry at Harvard, and achieved a distinguished reputation as an investigator and teacher, retiring as professor emeritus in 1887. He was a leading member of the U. S. Sanitary Commission during the Civil War.

**Gibeah**, ancient town in Palestine, situated to the s.e. of Hebron; also a Benjamite town about 4 m. n. of Jerusalem. The latter place was associated with several notable persons and incidents in the history of Israel.

**Gibeon**, a Hivite town in the country of Benjamin, Palestine, n.e. of Jerusalem. It is mentioned on monuments in 965 B.C., when it was captured by Shishak. The Gibeonites came into prominence during Joshua's time.

**Gibraltar** (Ar. *Jebel ot-Tarik*, 'mount of Tarik'; called *Calpe* by the Greeks), a bold, rocky promontory on the southern coast of Spain and a possession of Britain since its capture by Sir George Rooke on July 24, 1704. The southern extremity has an elevation at the Sugar-loaf Point of 1,439 ft., the northern extremity being a hundred feet lower. The entire length at the base of the rock is 2¾ m., and its greatest breadth three-quarters of a mile. The town nestles at the n.w. corner upon a narrow sandy flat. There is a deep harbor of 260 acres. At the extreme southern point of the rock are two projecting terraces or cliffs, respectively 300 ft. and 100 ft. high, forming Europa Point, which with Ceuta (Spanish), on the African coast, formed the 'pillars of Hercules' of the ancients. The town of Gibraltar, which is the see of an Anglican bishop, consists of a main street nearly a mile long; p. 20,638.

The neighboring Spanish town of La Linea de la Concepcion, which is really a suburb of Gibraltar, houses the working population of Gibraltar; p. 63,236. Gibraltar, being a free port as well as a naval base and coaling station, is much frequented as a depot and port of call. The place was celebrated in the times of the Phoenicians and Greeks, and was fortified by Tarik, the Berber leader, who invaded and conquered Spain in 711. It was finally captured by the Spaniards in 1462. After its capture by the British in the war of the Spanish Succession it was repeatedly attacked by the Spaniards, and underwent a long siege in 1726, and from 1779 to 1783, when it withstood the greatest siege in its history. As a naval base its position is of great strategic importance. Its defense was completely modernized by May 1941.

**Gibraltar, Strait of** (anc. *Fretum Hercu-*

leum), body of water, about 50 m. long and varying in breadth from  $8\frac{1}{2}$  to 23 m., which connects the Atlantic Ocean with the Mediterranean Sea.

**Gibson, Charles Dana** (1867-1944), American artist, was born in Roxbury, Mass. In 1886 he made his first contribution in black and white to *Life*, of which paper he was to be the chief illustrative contributor for many years. He developed particularly types of American society people which became associated with his name, especially the American girl. In 1905 he gave up illustrative work and devoted himself to portrait painting in oil, but eventually returned to his first field of endeavor. In 1920 he purchased *Life* and became chairman of the Board of Directors. His books include: *The Education of Mr. Pipp* (1899); *The Social Ladder* (1902); *The Weaker Sex* (1903); *Our Neighbors* (1905).

**Gibson, Hugh** (1883- ), American diplomat, was born in Los Angeles, Cal. After serving at the London embassy (1909-10), in Washington in the State Department (1910-11) and in Havana (1911-13), he became secretary of legation in Brussels, 1914-16. He was attached to the British and Belgian War Mission in 1917 and was on duty with Mr. Hoover in his war relief activities in 1919. From 1919 to 1924 he was U. S. minister to Poland, in 1924-27 U. S. minister to Switzerland, from 1927-33 U. S. Ambassador to Belgium, later Ambassador to Brazil. He was chairman of the U. S. delegation to the Geneva Preparatory Conference on the Limitation of Armament, chairman of the Three-Power Naval Conference in Geneva, 1927, and a delegate to the Naval Limitation Conference in London, 1930. With Herbert Hoover he wrote *The Problems of Lasting Peace* (1942).

**Gibson, John** (1790-1866), British sculptor, son of a Welsh market gardener, was born in Gyffin, near Conway. His most famous works are *The Hunter and Dog*, *The Tinted Venus*, *Pandora*, *Mars and Cupid*, *Hero and Leander* and two statues of *Queen Victoria*.

**Gibson, William Hamilton** (1850-96), artist and naturalist, was born in Sandy Hook, Conn. He wrote articles concerning the ways of flowers and insects and on out-of-door life, illustrated by himself, and, in particular, he became an authority on the cross fertilization of plants. His illustrations for E. P. Roe's *Nature's Serial Story* (1885) are noteworthy. His own works include: *Camp Life in the Woods* (1876); *Highways and Byways* (1883); *Sharp Eyes* (1891).

**Giddiness.** See **Vertigo**.

**Giddings, Franklin Henry** (1855-1931), American sociologist, was born in Sherman, Conn. In 1894 he became professor of sociology in Columbia University. He has published *Descriptive and Historical Sociology* (1906); *Studies in the Theory of Human Society* (1922); *The Scientific Study of Human Society* (1924), etc.

**Giddings, Joshua Reed** (1795-1864), American legislator and abolitionist, was born in Pa. He was elected to Congress in 1838 as an anti-slavery Whig. Here he served for ten consecutive terms, and at every opportunity endeavored to arouse anti-slavery sentiment. He published *Exiles of Florida* (1858); *History of the Rebellion* (1864).

**Giddings Resolutions.** See **Creole Case**.

**Gideon**, the warrior judge who delivered Israel from the Midianites. He was also known as Jerubbaal, on account of his destruction of the Baal altar at Ophrah. Having been commissioned by a divine visitant to free the nation from the Midianite yoke, Gideon, with a picked force of 300 men, surprised and routed the enemy.

**Gideons, The**, or the Christian Commercial Travellers' Association of America, was organized at Janesville, Wis., in 1899. The name commemorates the story of Gideon and his 300 men, who by their obedience to God and their willingness to act against an overwhelming force overcame the hosts of Midian. during the early history of the Israelites. The object of The Gideons is to win, through their personal Christian influence, commercial travellers, business men, and others for the kingdom of Christ, as they go about their regular business. As a means of reaching the commercial traveller, copies of the Bible are placed in the guest rooms of all the commercial hotels in the United States and Canada, more than 1,000,000 copies having been provided while thousands of English and foreign language Bibles have been distributed in the Orient. The national headquarters are in Chicago, where a magazine, *The Gideon*, is published.

**Gielgud, John** (1904- ), English actor-manager. First stage appearance in 1921, and first New York appearance in 1928. In 1936-1937, he appeared in *Hamlet*, which broke all records for the greatest number of performances of this play. He later appeared in motion pictures.

**Gies, William John** (1872- ), American biological chemist, was born in Reisters-town, Md. He has been prof. of biological



*The Rock of Gibraltar.*

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chemistry since 1907 at Columbia U. Since 1902 he has also been consulting chemist for the New York Botanical Garden. He has written *Textbook of General Chemistry* (1904); *Biochemical Researches* (5 vols. 1903-11), etc.

**Giessen**, town, Germany, in the republic of Hesse, on the Lahn; 41 m. n. of Frankfurt-on-Main. It is the seat of a university and the Liebig Museum where Liebig, the celebrated chemist, carried on his research work; p. 33,600.

**Gifford, Robert Swain** (1840-1905), American landscape painter and etcher, was born on Naushon Island, Mass. He was one of the founders of the organization now known as the American Water Color Society in 1866. He visited the West in 1869, and Europe and Northern Africa in 1870 and 1874; these tours resulting in many of his finest paintings, particularly his Saharan scenes.

**Gifford, William** (1756-1826), English editor and writer, was born in Ashburton. His metrical translation of Juvenal appeared in 1802; but he had already written the *Baviad* (1794) and the *Maviad* (1795), wherein he pitilessly satirized the mawkish sentimentality of the school of writers known as 'Della Cruscans.' In 1809 he was appointed first editor of the *Quarterly Review*, continuing in the editorship till 1824. His editorial interpolations and omissions and bitter criticisms caused considerable annoyance to his contributors, notably to Lamb, Southey and Keats. His other publications include *Epistle to Peter Pindar* (1800); *Examination of the Strictures of the Critical Reviewers on the Translation of Juvenal* (1803).

**Gift**, in law a voluntary transfer of property without a consideration by a person legally competent to do so, which is accepted by the donee. Strictly speaking, it must take effect immediately, but the term is sometimes applied to a bequest by will. A gift may be *inter vivos*, the ordinary form; or *causa mortis*, that is, in view of death.

**Gig**, a name applied to (1) a light two-wheeled carriage drawn by one horse; (2) a long, narrow, light rowing boat, somewhat wider than a shell, adapted for speed.

**Gigantes**, in ancient Greek legend, the race of giants who sprang from the blood of Uranus, which fell on the earth when he was mutilated by Cronus; hence the earth, *Gæa*, was their mother.

**Gigantism**. See **Acromegaly**; **Giants**.

**Gijon**, city, Spain, in the province of Oviedo, on the Bay of Biscay. It is a prosperous

city, and one of the best ports on the Spanish Biscay coast. In summer it is a popular sea-bathing resort. Gaspar de Jovellanos was a native, and founded the Instituto Jovellanos, now a nautical and technical institution, having a fine art collection. Other features of the town are the Campos Eliseos, a bull ring, a fine 15th-century church, and two palaces. It was the capital of the Asturian princes in the 8th century; p. 57,573.

**Gila Monster**, a poisonous lizard of the genus *Heloderma*. See **HELODERMA**.

**Gilan**, or **Ghilan**, province of Persia, bordering the Caspian Sea on the s.; area, about 6,000 sq. m. A low coastland overgrown with thick forests, fertile and well watered, produces rice, peaches, figs. and plums; p. 200,000.

**Gila River**, a river of the United States, tributary to the Colorado. It rises in Western New Mexico in two main branches, the Gila proper and the Salt River, and for about 550 miles flows in a general westerly course, traversing Arizona, to its junction with the Rio Colorado at Yuma. Along its lower course are ruins of houses and traces of irrigation canals constructed by a partly civilized race.

**Gilbert, Anne Hartley** (1821-1904), American actress, was born in Rochdale, England. Her first important appearance as an actress was as Mrs. Hardcastle to the Tony Lumpkin of W. E. Burton in *She Stoops to Conquer*, at Cleveland in 1857. Mrs. Gilbert devoted herself to 'old woman' parts. She made her first appearance in New York in 1864, and in 1869 joined the company of Mr. Daly.

**Gilbert, Cass** (1859-1934), American architect, was born in Zanesville, O. He designed the capital and other buildings in St. Paul, U. S. Custom House, Woolworth and New York Life Insurance buildings, in New York and many other notable buildings. He also drew the plans for the buildings of the University of Minnesota and the University of Texas. He was on the juries for the Chicago and Paris Expositions; was one of the founders of the Architectural League; president of the American Institute of Architects (1908-9), National Academician, and was appointed by President Roosevelt chairman of the Council of the Fine Arts, and by President Taft member of the Commission of Fine Arts.

**Gilbert, Charles Henry** (1859-1928), American zoologist, was born in Rockford, Ill. He was professor of zoology at Leland Stanford Jr. University (1891-1928). He was in



charge of the American explorations in Hawaii (1902), and in the Northwest Pacific and Japan (1906); and was assistant on the International Fisheries Commission (1909 and 1910). He has written, with David Starr Jordan, *Synopsis of the Fishes of North America* (1882); with E. C. Starks, *Fishes of Panama Bay* (1904); *Deep Sea Fishes of the Hawaiian Islands* (1905); and many papers on ichthyology.

**Gilbert, Sir Humphrey** (1539-83), English seaman, the son of a Devon gentleman, and half-brother to Sir Walter Raleigh, was born in Compton. He was eager to discover the Northeast passage to Cataia and after repeated failures to obtain his desire, at length in 1578 he set out to discover and possess unoccupied lands in North America. In 1583 he took possession of Newfoundland, and planted the first English colony in America near the harbor of Saint John's. He explored the coast toward the south, suffered several disasters, and, returning with the *Golden Hind* and *Squirrel*, the sole survivors of his flotilla, went down in the latter on the night of Sept. 9, 1583.

**Gilbert, Sir John** (1817-97), English painter and illustrator. His first exhibited work was a water-color drawing, *Arrest of Lord Hastings* (1836). After this he executed, in oil, scenes from Shakespeare, Cervantes, and Scott, also historical compositions in both mediums and pictures of gypsy life. As an illustrator he contributed to the *Illustrated London News* the *London Journal*, and illustrated many of the British classics.

**Gilbert, John** (1897-1935), actor. He entered motion pictures and starred in many films including *The Big Parade* and *Queen Christina*. It was the general opinion that his death was brought on from disappointment over not having a voice suitable for talking pictures.

**Gilbert, John Gibbs** (1810-89), American comedian. For forty years he had no rival on the American stage in old men parts. His most famous parts were Sir Peter Teazle and Sir Anthony Absolute.

**Gilbert, Sir Joseph Henry** (1817-1901), English chemist, was born in Hull. In 1843, with his fellow-student, Sir J. B. Lawes, he entered upon fifty-seven years' research in agricultural chemistry and vegetable physiology. For Liebig's 'mineral theory' they substituted the 'nitrogen theory,' thereby revolutionizing scientific farming. Gilbert travelled in the United States in 1882, 1884, and 1893, in the interests of science. An account

of his experiments will be found in *Bulletin* 22 of the U. S. Experiment Station.

**Gilbert, Linda** (1847-95), American philanthropist, was born in Rochester, N. Y. She became interested in the amelioration of prison life, and on the death of her fiancé, who bequeathed to her a fortune, she devoted herself to the organization of the Gilbert Library and Prisoners' Aid Society, of which she became president.

**Gilbert, Rufus Henry** (1832-85), American inventor and physician, was born in Guilford, N. Y. He performed at Big Bethel the first field operation of the Civil War and was appointed medical director and superintendent of the U. S. Army hospitals. He later became interested in the problem of rapid transportation in large cities, especially New York. In 1872 he obtained a charter at Albany, and in spite of opposition the Sixth Avenue elevated railway was built in New York City.

**Gilbert, Seymour Parker** (1892-1938), American lawyer and financial expert, was born in Bloomfield, N. J. He was a member of the War Loan Staff, assistant secretary of the treasury, 1920-21, and under secretary of the treasury, 1921-23. Returning to his law practice in 1923, the following year he was appointed agent general for reparations payments of Germany and in 1931 became a partner in the firm of J. P. Morgan & Co.

**Gilbert, William** (1540-1603), English physician, was born in Colchester, Essex. He was educated at St. John's, became president of the College of Physicians (1603), and court physician to Elizabeth and James I. In 1600 appeared his *De Magnete, Magneticisque Corporibus*, etc., in which he laid down theories on terrestrial magnetism and electricity now established as correct. He was the first to use the terms 'electric force' and 'magnetic pole.' His *Di Mundo nostro Sublunari Philosophia Nova* was published at Amsterdam in 1651.

**Gilbert, Sir William Schwenck** (1836-1911), English dramatist, was born in London. His first play, *Dulcamara*, was produced in 1866; and in 1869 and 1873 he published the humorous *Bab Ballads*. Two whimsical plays, *The Palace of Truth* and *The Wicked World*, appeared in 1870 and 1873 respectively. His comedies and prose plays include *Pygmalion and Galatea* (1871); *Tom Cobb* (1875); *Engaged* (1877); *Foggerty's Fairy* (1881); *Branlinghame Hall* (1888); *Harlequin and the Fairy's Dilemma* (1904). In 1871 Gilbert's collaboration with Sir Arthur Sullivan began with *Thespis*, followed by *Trial by Jury* (1875); *The Sorcerer* (1877); *H. M. S.*

*Pinafore* (1878); *Pirates of Penzance* (1880); *Patience* (1881); and the famous 'Savoy' series of comic operas, *Iolanthe* (1882); *Princess Ida* (1884); *The Mikado* (1885); *Ruddigore* (1887); *Ysomen of the Guard* (1888); *The Gondoliers* (1889); *Utopia* (1893); *The Grand Duke* (1896). Besides these he has written to the music of other composers. His last work was a playlet, *The Hooligan*, produced in 1911.

His humor is of a unique quality; while his ability as a versifier is unsurpassed, and his writing of lyrics marked by the greatest literary care and a most graceful fancy. He was knighted in 1907. Consult Cellier and Bridgeman's *Gilbert and Sullivan and their Operas* (1914).

**Gilbertines**, a monastic order founded in 1135 by St. Gilbert. He first established a convent for women whom he had taught at Sempringham, and later formed a society of lay brothers to cultivate the fields and do the rougher work for the nuns. Later, failing to get his order incorporated in the Cistercian order, the men became canons regular and lived according to the rule of St. Augustine and the women to that of St. Benedict.

**Gilbert Islands**, or **Kingsmill Islands**, a group of 16 small coral islands in the Pacific, belong to Great Britain. They lie on the equator and cover 166 sq. m. Copra, phosphate and sharks' fins are the leading exports; p. 24,000.

**Gilboa**, mountain on the great plain of Esdraelon, Palestine, the scene of Saul's last battle, and widely celebrated in David's lament for Jonathan.

**Gilchrist, Alexander** (1828-61), English biographer, was born in Newington Green, London. His *Life of Etty* was published in 1855 and in 1857 he began his *Life of Blake*, a masterpiece of careful biography, almost finished when the author died. He numbered Rossetti and Carlyle among his friends.

**Gilchrist, William Wallace** (1864-1916), American organist and composer, was born in Jersey City, N. J. He joined the faculty of the Philadelphia Musical Academy in 1882 as professor of organ and composition. In 1880 he won the prize offered by the New York Mendelssohn Glee Club with a composition entitled *Autumn Dreaming*, and in 1882 the prize of the Cincinnati Musical Festival with his *Psalm XLVI*. He composed church music, songs, and symphonies. Among his published works are a cantata, *The Rose* (1887); *Song of Thanksgiving* (1888); *Ode to the Sun* (1890).

**Gildas**, or **Gildus** (516-570), English historian, surnamed 'Sapiens' and also 'Badonicus,' from one of the battles between the Saxons and Britons, about whom little is known. His *De Excidio Britanniae*, first printed by Polydore Vergil in 1525, first English version by Habington in 1638, is the sole authority for British history during the 5th century.

**Gilder, Jeannette Leonard** (1849-1916), American journalist, was born in Flushing, N. Y. In 1881 she established, with her brother, Joseph B. Gilder, *The Critic* of New York, a literary journal published for many years as a weekly, subsequently changed to a monthly, and in 1906 to *Putnam's Magazine*, of which she was associate editor. Besides several plays and novels, Miss Gilder edited, singly or in collaboration with others: *Essays from the Critic* (1882), *Representative Poems by Living Persons* (1886); *Pen Portraits of Literary Women* (1887); *Authors at Home* (1889).

**Gilder, Richard Watson** (1844-1909), American editor and poet, was born in Bordentown, N. J. In 1870 he was made managing editor of *Scribner's Monthly*, in 1881 succeeding Dr. Holland as editor of *Scribner's*, later the *Century Magazine*, a position he retained until his death. As chairman of the New York Tenement Commission of 1894, he helped initiate many improvements in the tenement districts. He was a member of the American Institute of Arts and Letters. Among his published works are *The New Day* (1875); *Five Books of Song* (1894); *A Book of Music* (1906); *The Fire Divine* (1907); *Collected Poems* (1908).

**Gilder, Robert Fletcher** (1856-1940), American journalist and archæologist, was born in Flushing, N. Y. In 1906 he discovered the Nebraska Loess man, the oldest human remains found in America up to that time, and also many pueblo ruins hitherto unknown. He is the author of many monographs on archæology.

**Gilder, William Henry** (1838-1900), American Arctic explorer, brother of R. W. Gilder, was born in Philadelphia, Pa. He aided in the search for the De Long expedition (1881) under Captain Berry in the *Rodgers*, and when that vessel was burned on the western shore of Bering Strait, he carried the news 2,000 miles by sledge to the nearest telegraph station in Siberia. He published *Schwatka's Search* (1881), *Ice Pack and Tundra* (1883).

**Gildersleeve, Basil Lanneau** (1831-1924), American classical scholar and au-

thor. was born in Charleston, S. C. During 1870-1915 he was professor of Greek at Johns Hopkins, Baltimore. He was the first editor of the *American Journal of Philology*, founded in 1880, and the author of many textbooks, including several editions of his *Latin Grammar*. He was a member of the Academy of Arts and Letters.

**Gildersleeve, Virginia Crocheron** (1877- ), American educator, was born in New York City and has been professor of English and dean of Barnard College since 1911. In 1924-26 she was President of the International Federation of University Women. Her published works include *Government Regulation of the Elizabethan Drama* (1908).

**Gilding**, the art of covering baser materials with gold. It is an ancient art and was practised by the Hebrews, Egyptians, Romans, and others. Modern methods of gilding may be classified under three heads: those in which thin leaves of gold are attached by means of suitable adhesives; the application of finely-divided pulverulent metal instead of leaf; and chemical or electrochemical processes. For electrogilding or gold-plating, see ELECTRO-DEPOSITION.

**Gilead**, or **Mount Gilead**, a region of Palestine east of the Jordan, roughly bounded by the River Yarmak on the n., and a line passing through the north end of the Dead Sea on the s., though it seems to have included also the tribal territory of Gad. Gilead is a land of great beauty and fertility and is often mentioned in the Bible. See also BALM OF GILEAD.

**Giles, Herbert Allen** (1845-1935), English Chinese scholar, was educated at Charterhouse. He was in the consular service in China (1867-93) and in 1893 was made professor of Chinese in Cambridge University. His publications include *Chinese without a Teacher* (1872; 5th ed. 1900); *Buddhist Kingdoms* (1877); *Civilization of China* (1911); *Chaos in China* (1924); *Quips from a Chinese Jest Book* (1925), etc.

**Giles, St.** (Lat. *Ægidius*), a French hermit who probably lived in the end of the 7th century. In the 11th and 12th centuries the worship of St. Giles, who was the patron of lepers, cripples, and beggars, spread very widely. His day is September 1.

**Gilfillan, George** (1813-78), Scottish essayist, was born in Comrie, Perthshire. Among his works are *Gallery of Literary Portraits* (three series, 1845, 1850 and 1854); *Lives of Burns* (1856, 1879) and Scott (1870); *History of a Man* (1856).

**Gilgal**, the name of three places in Palestine, of which the most famous was 3 m. e. of Jericho, in the Jordan valley. Another Gilgal was in Mount Ephraim north of Bethel. A third, called Gilgal of the Goim or 'nations' was in Sharon, s.e. of Cæsarea. The Samaritans recognized a fourth Gilgal, near Shechem. Gilgal near Jericho was a sacred site in Samuel's time, and the scene of Saul's election as king over the Israelites.

**Gilgit**, or **Gilghit**, district of Northwest Kashmir; since 1889 a British agency. Included in it are the valleys of Chitral, Gilgit, and a part of the Indus, Hunza, Swat, and Ladak; total area, between 20,000 and 30,000 sq. m. The town is situated about twenty m. from the Indus.

**Gilia**, or **Gilli, Filipe Salvatore** (1721-89), Italian Jesuit missionary, was born in Legnano. He embarked for South America about 1740 and for 18 years traversed the vast region watered by the Orinoco, laboring among the Indians. On his return home he wrote *Saggio di Storia Americana* (1780-4), a valuable description of the Indian tribes.

**Gill**, a measure for liquids, containing one-fourth of a standard pint. See WEIGHTS AND MEASURES.

**Gill, Theodore Nicholas** (1837-1914), American zoologist and educator, was born in New York City. Besides his reports on zoology for the Smithsonian Institution, Dr. Gill published numerous books on mollusks and fishes and general work on zoology, including a *Catalogue of the Fishes of the East Coast of North America* (1861-73), and *An Account of Progress in Zoology* (1882).

**Gillenia**, a genus of American plants belonging to the order Rosaceæ.

**Gillespie, Eliza Maria** ('Mother Mary of St. Angela') (1824-87), American *religieuse*, was born near West Brownsville, Washington co., Pa. In 1855 she was made superior of the Academy of St. Mary's in Bertrand, Mich. The next year she arranged for the removal of the institution to St. Mary's, Ind., and, securing a State charter, founded a conservatory of music, and made other permanent arrangements. During the remainder of her life Mother Mary established more than twenty-five similar academies in the United States.

**Gillette, William Hooker** (1855-1937), American actor and playwright, was born in Hartford, Conn. He went to the Madison Square Theatre, N. Y., in 1880 with *The Private Secretary*, an adaptation that he had made from the German. Among his chief plays, in which he has usually taken the leading part,

are *Clarice*; *Secret Service* (1899); and *Sherlock Holmes* (1899), a popular play made up of incidents from Conan Doyle's detective stories. In 1903 he appeared with much success in Barrie's *Admirable Crichton*, in 1910 in *Dear Brutus* and in 1914 in *Diplomacy*.

**Gilliflower**, a term which has been applied to a number of different plants, such as the carnation and pink.

**Gillis Land**, island, in the Arctic regions, about  $81^{\circ}$  N. lat. and between  $36^{\circ}$  and  $42^{\circ}$  E. long. It was first sighted by Gillis in 1707 and was first explored in 1808.

**Gilliss, James Melville** (1811-65), American astronomer, was born in Georgetown, D. C. He organized, under a special appointment, the first regular government observatory for astronomical and meteorological records in the country, and in 1842 Congress authorized its installation in a new building with Gilliss, by that time a lieutenant, as architect. He reduced the series of moon-culminations previously made by him, for the use of the coast survey, completing the work in 15 volumes. Other important works are *The U. S. Astronomical Expedition to the Southern Hemisphere in 1849-52* (1855); *An Account of the Total Eclipse of the Sun on September 7, 1858* (1859). In 1861 he succeeded M. F. Maury as superintendent of the Washington Observatory.

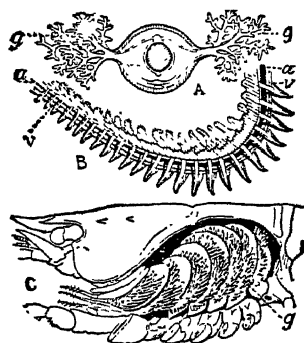
**Gillmore, Quincy Adams** (1828-88), American soldier and engineer, was born in Lorraine co., O. He was chief of engineers of the Port Royal expedition, and planned the capture of Fort Pulaski. In 1862 he was made brigadier-general of volunteers, and served in Western Virginia and Kentucky until June, 1863, when he became commander of the Department of the South. In July, 1864, he was called to the defence of Washington, threatened by Early's raid.

**Gillott, Joseph** (1799-1873), English pen-maker, was born in Sheffield. He turned his attention (1830) to new mechanical processes for the manufacture of steel pens and established extensive works.

**Gillray, James** (1757-1815), English caricaturist, was born in Chelsea. His first caricature, published in 1779, established his reputation and for years he had no rival. His known caricatures exceed 12,000.

**Gills, or Branchiæ**, the breathing organs of aquatic animals. They vary infinitely in structure, from the simple 'skin-gills'—mere pouches of the skin—of some echinoderms to the elaborate organs of fish. Gills tend either to be arborescent organs, or to consist of a

series of thin plates, both modifications serving to increase the respiratory surface. In invertebrates the gills are simply outgrowths of the body wall, as are also the external gills of certain vertebrates. The internal gills of the aquatic vertebrates, on the other hand, arise in connection with the gill-clefts, which are perforations of the wall of the alimentary canal, and are associated with supporting bars,



Gills

A. Transverse section of a worm (*Arenicola*) with external gills. B. Branchial arch of perch: a, artery; v, vein. C. Thorax of crayfish, portion of carapace removed to show gills.

the gill-arches. In the vertebrate series, breathing by gill-clefts precedes breathing by gills, which is a specialized derivative of the former method. In invertebrates the less specialized forms breathe by the whole surface of the skin. In the chætopods all stages may be observed.

**Gilman, Arthur** (1821-82), American architect and lecturer, was born in Newburyport, Mass. He designed many important structures, among them the Boston City Hall, the Equitable Life Assurance Society's building in New York, and a part of the State Capitol at Albany.

**Gilman, Arthur** (1837-1909), American educator, was born in Alton, Ill. In 1876, Mr Gilman, with his wife, originated 'The Society for the Collegiate Instruction of Women,' known as 'The Harvard Annex,' and was its executive officer until its reorganization in 1894 as Radcliffe College, when he became regent, holding this position for two years. In 1886 he founded at Cambridge the Gilman School for Young Ladies, of which he was director. His publications comprise many popular historical works, including *The Story of Rome* (1886), and *The Making of the American Nation* (1887). He edited *The Poetical*

*Works of Geoffrey Chaucer* (3 vols., 1879) and other texts.

**Gilman, Charlotte Perkins** (1860-1935), American author and lecturer, great granddaughter of Lyman Beecher, was born in Hartford, Conn. Mrs. Gilman lectured frequently on economic and social questions and became widely known as an advocate of woman suffrage. Her published works include *Women and Economics* (1898), *The Man-Made World* (1911), *His Religion and Hers* (1923).

**Gilman, Daniel Coit** (1831-1908), American educator, was born in Norwich, Conn. In 1872 he accepted the presidency of the University of California. Having helped to organize the Johns Hopkins University, Baltimore, he became its first president (1875)—an office which he held until 1902. The year previous he had been chosen first president of the Carnegie Institution at Washington, retiring in 1904. He served on the Venezuela Boundary Commission (1896), and was a leading member of a number of educational boards and commissions, and of the Academy of Arts and Letters. His best known works are *University Problems* (1898), the *Life of President Monroe* (1883; 2d. ed. 1898), and *Science and Letters in Yale* (1901). He was one of the three general editors of the *New International Encyclopædia* (1902-4).

**Gilman, John Taylor** (1753-1828), American public official, was born in Exeter, N. H. He was a member of the legislature in 1779 and represented his State in the convention at Hartford in 1780. In 1782-83 he was a member of the Continental Congress, but resigned to become State treasurer. From 1794 to 1805 he was governor of New Hampshire, and again held that office from 1813 to 1816.

**Gilman, Lawrence** (1878-1939), American music critic, was born in Flushing, N. Y. He was on the editorial staff of *Harper's Magazine* (1913-15), was musical and dramatic critic for the *North American Review* (1915-23) and since that time has been music critic for the *New York Herald-Tribune*. He is a member of the National Institute of Arts and Letters. He has composed a number of pieces of both vocal and instrumental music, and has published *Phases of Modern Music* (1904), *Edward MacDowell*, in 'Living Masters of Music' series (1905); *A Christmas Meditation* (1916), etc.

**Gilmore, James Roberts** (1822-1903), American author and journalist, was born in Boston, Mass. In 1862, with Robert J. Walker, ex-secretary of the United States

Treasury, and Charles G. Leland, he founded the *Continental Monthly*, a publication devoted to the emancipation of the negro, to which cause he also gave his services during several years as an editorial writer upon the *New York Tribune*. In 1864, in coöperation with Col. James F. Jacquess, and acting as an unofficial agent of President Lincoln, he made peace proposals to President Davis at Richmond. These proposals were immediately rejected but the story, as told in the columns of the *Tribune* and in the *Atlantic Monthly*, are said to have won many votes for Lincoln as against McClellan in the presidential campaign that followed. His books include *Among the Pines* (1862); *Down in Tennessee* (1863); and *Personal Recollections of Abraham Lincoln and the Civil War* (1898).

**Gilmore, Patrick Sarsfield** (1829-92), an American bandmaster, born near Dublin, Ireland. At the outbreak of the Civil War he went to the front as bandmaster, and exhibited a genius for the organization of band festivals upon a colossal scale. At the Peace Jubilees which he organized in Boston in 1869 and 1872 he employed an orchestra and band of 1,000 musicians, a chorus of 10,000 voices, the whole supplemented by cannon, bells and anvils. Such extravagances were ridiculed by musicians, but made him famous with the multitude. In 1875 he became bandmaster of the 22d Regiment in New York City, and for many years before his death in St. Louis, Mo., made successful tours with his band.

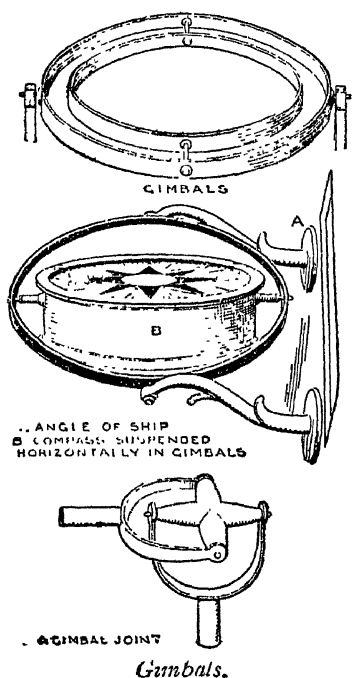
**Gilpin, Bernard** (1517-85), English clergyman, called the 'Apostle of the North,' was born in Kentmere, Westmorland. He was appointed rector of the large parish of Houghton-le-Spring, Durham, where he became famous for his benevolence and his self-sacrifice. See *Life* by Carleton (1629; 1852); also Colingwood's *Memoirs of Bernard Gilpin* (1884).

**Gilthead** (*Chrysophrys aurata*), a fish belonging to the family of the sea-brems (Sparidae), which is common in the Mediterranean, and occasionally occurs off the south coast of England.

**Gilyaks**, a small Tungus tribe occupying the northern part of the island of Sakhalin and the valley of the Lower Amur to the Sea of Okhotsk. See Laufer's 'Explorations among the Amoor Tribes' (*American Anthropologist*, 1900).

**Gimbals**, two circular brass hoops designed to keep a marine compass, chronometer lamp, or other instrument in the horizontal position on board ship, notwithstanding the rolling and pitching of the vessel.

**Gimp**, a flat trimming made of silk, worsted, or other cord, usually stiffened by wire, and more or less open in design. Military gimps are made of gold and silver.



**Gin.** or **Geneva**, an ardent spirit produced from malted and fermented liquor by distillation. In preparing the best qualities, special attention is given to rendering the spirit neutral. Its alcoholic strength varies from 40 to 52 per cent. Holland gin, Schiedam, or schnapps is a variety manufactured in the district of Schiedam in Holland from a mixed grist of barley, malt, and rye.

**Kindely, Anton** (1829-92), Bohemian historian born and died at Prague. He was successively professor of history at Olmütz (1853-5) and Prague. He made an exhaustive study of the period of the Thirty Years' War, and published many works.

**Ginger**, the dried rhizome of the tropical plant *Zingiber officinale*. It is used in cookery, because of its aromatic volatile oil, and as a confection, either in syrup or 'crystallized' with sugar. In medicine it is employed as a carminative, usually in the form of the tincture. It is grown principally in the East Indies (its original home), the West Indies, and tropical Africa.

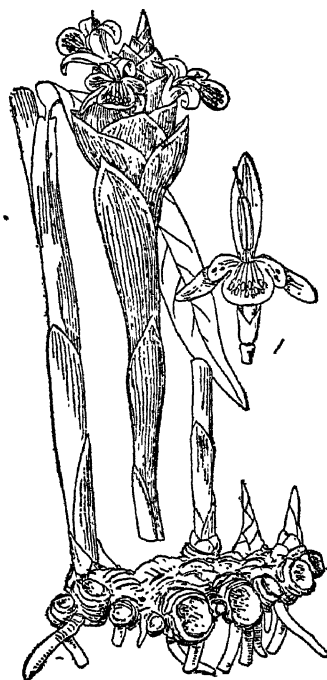
**Gingham**, cotton dress goods woven of

variously colored threads, generally in some checked or striped pattern.

**Ginkgo**. A monotypic genus of gymnosperms, with deciduous foliage. The leaves are fan-shaped and the branches are long and horizontal, forming an acute pyramidal head.

**Giguéné, Pierre Louis** (1748-1816), French literary historian, born at Rennes (Brittany). He produced the *Histoire Littéraire d'Italie* (1811-24), his chief work, which, in spite of some inaccuracies, is an important authority on the subject.

**Ginsburg, Christian David** (1831-1914), Polish rabbinical scholar, born in Warsaw. His chief works are *The Massorah* (1880); *Critical and Historical Commentaries on the Song of Songs, Ecclesiastes* (1857), and *Leviticus* (1882); historical accounts of the *Karaites* (1862) and the *Essenes* (1864); and the important *Critical Text of the Hebrew Bible* (1894), and *Introduction of the Hebrew Bible*



*Ginger.*

1, Flowers.

(1896). Dr. Ginsburg was one of the original members for the revision of the Old Testament.

**Ginseng**. An araliaceous herb (*Panax quinquefolium*) the root of which is exported to

China, the Orientals using it for various medical purposes; but its virtues, aside from a warming, aromatic taste, are more suppositious than real. See *Bull. No. 16, U. S. Dept. Agric., Div. of Botany* (revised by M. G. Kains, 1898), Kains's *Ginseng, its cult., etc.*

**Gioberti Vincenzo** (1801-52), Italian philosopher and politician, a native of Turin. Exiled from Italy, he wrote *Teorica del Sovran naturale* (1838); *Introduzione allo Studio della Filosofia* (1839), his most important work. His political propaganda was set forth

in 11 vols. (1856-63); and books by P. de Nardi (1901), A. Saletti (1901), and F. P. Pugliese (1902).

**Giocondo, Giovanni** (1435-1515), Italian architect and antiquarian, born at Verona; became a Franciscan. He constructed (1499) the bridge of Notre Dame at Paris; fortified (1509) the city of Treviso; and was summoned (1513) to Rome by Leo x., after the death of Bramante, to complete the building of St. Peter's.

**Giollitti, Giovanni** (1844-1928), Italian



Giraffes.

in *Del Primato Morale e Civile degli Italiani* (1843), which, with *Il Gesuita Moderno* (1846-7), paved the way for Gioberti's enthusiastic recall to Italy (1848), and his appointment as deputy by Turin and Genoa, and finally as president of the Chamber. He spent his last years in Paris, where he published the important *Del Rinnovamento Civile d'Italia* (1851). His dominant note echoes the Platonic idealism, contending for the embodiment of the *idea* in civilization. See *Vita* (1848) by Massari, who issued an edition of his works

statesman, born at Mondovi. He served in the Treasury, of which he became head under Crispi in 1889. In 1892 he united the premiership with the ministry of the interior. He was again premier and minister of the interior, 1906-9.

**Giordani, Pietro** (1774-1848), Italian patriot and author, was born at Piacenza. Giordani was one of the most profound Greek and Latin scholars of his day; and his *Opere* (1851; also 1854-8, 14 vols.), mostly treatises upon art and literature, are written in a ma-

jestic and elaborate style which is regarded as a model for Italian prose.

**Giordano, Luca** (1632-1705), nicknamed FA PRESTO ('Make Haste'), Italian painter, born at Naples. Painter to the king of Spain, he was called to Madrid (1692), and decorated the main staircase at the Escorial, painted the church there, and the cathedral of Toledo. His chief works are *Christ Expelling the Traders from the Temple* (Naples), frescoes of *Moses and the Brazen Serpent* (Certosa at Pavina), and *Judgment of Paris* (Berlin Museum).

**Giorgio, Francesco di** (1439-1502), Italian architect, a native of Siena. A good example of his architectural skill is the church of the Madonna del Calcinajo, near Cortona. Giorgio wrote an important *Trattato di Ar-*

*The Family of Giorgione* (Giovannelli Palace, Venice); *The Three Philosophers* (Vienna); *The Concert* (Pitti Palace, Florence).

**Giotto**, whose real name was Tommaso di Stefano (1266-1337), Florentine painter, who, being a pupil of Giotto, was called for the sake of distinction Giotto. The frescoes representing the *Miracles of St. Silvestro* in the church of Santa Croce at Florence are believed to be by his hand, as is a painting of the *Apparition of the Virgin to St. Bernard* in the Florentine Academy.

**Giotto di Bondone** (1266-1337), one of the most eminent of Italian artists and architects, son of a peasant, born at Vespignano, near Florence. Cimabue took him into his own house when he was about 13. Giotto was in-



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Main Building, Girard College, Philadelphia.

*chitettura, Civile e Militare*, which was issued in 1841. There are bronze angels of his fashioning at Siena.

**Giorgione** ('Big George'), the cognomen of Giorgio Barbarbelli (c. 1478-1511), Venetian painter, one of the seven supreme colorists of the renaissance, was born at Castelfranco, near Treviso, where his *Madonna* still is. He invented the Venetian species of 'romance easel picture,' with episodes in *novella* form. Instead of using oil as Bellini did, he preferred to paint his easel pictures in *tempera*, glazed with oil—a process that has preserved the brilliancy of his 'flaming coloring.' His authentic works are *The Madonna with SS. Francis and Liberale* (Castelfranco); *The Sleeping Venus* (Dresden); *Fête Champêtre* (Louvre);

vited to Rome about 1298, and executed the famous mosaic in the vestibule of St. Peter's called the *Navicella, or Disciples in a Ship amid Tempest*. Giotto's most elaborate remaining work in painting is in the Arena chapel at Padua, begun in 1303, a series of 38 subjects from the life of the Virgin and of Christ, 14 cardinal virtues and their opposing vices, a lunette, and a *Last Judgment*. (See Ruskin's *Giotto and his Works at Padua*, new ed. 1900.) At Assisi Giotto painted the ceiling of the lower church with the Franciscan allegories of *Poverty, Chastity, and Obedience*; and at Naples some of his work may be seen in the convent of Santa Chiara. In 1334 Giotto was summoned to Florence, to complete the great work of Santa Maria del



Fiore, the cathedral. The exquisite campanile and the façade are Giotto's design, carried out by his successor, Andrea Pisano, and his own pupils. See Ruskin's 'Shepherd's Tower' in *Mornings in Florence* (1886), and his *Seven Lamps of Architecture* (new ed. 1880); Vasari's *Lives of Painters, Sculptors, and Architects*, edited by Blashfield and Hopkins (1896); De Selincourt's *Giotto* (1905), and Sirén's *Giotto and Some of His Followers* (1917).

**Gippsland**, the s.e. district of Victoria, Australia; has an area of 13,900 sq.m. It is rugged and mountainous in the n. and e., and in the s. and w. is very suitable for farming and cattle-grazing. Its mineral resources are very great.

**Gipsy**. See **Gypsies**.

**Giraffe**, or **Camelopard** (*Giraffa camelopardalis*), an even-toed ungulate, confined to Africa. Owing to the great length of the neck and the limbs, the giraffe is by far the tallest of mammals. In the ordinary giraffe there are two 'horns,' or bony prominences only a few inches in length, and covered with hairy skin; and there is, in addition, a dome-shaped protuberance between the eyes, sometimes called the third horn. They are never shed, but retain throughout life their hairy covering. Among other important structural peculiarities of the giraffe, there are only two toes on both fore and hind feet, and the canines as well as the incisors are absent in the upper jaw. The length of neck and limbs enables the animals to browse with ease on the young shoots of high trees. The bulls may reach a height of 18 or 19 ft., while the females are considerably smaller. The giraffe is now greatly reduced in numbers and lives in herds, with an old male as leader. See the works of African travellers, especially C. G. Schillings' *Flashlights in the Jungle* (1906).

**Girard, Philippe de** (1775-1845), French mechanic, born at Lourmarin (Vaucluse), invented the first successful flax-spinning machine, for which a prize of a million francs had been offered by Napoleon. Girard went to Austria (1815), where he conducted a flax-mill at Hirtenberg, near Vienna, and built the first steamships on the Danube (1818). He was also chief engineer (1825) of the Polish mines. See E. Deschamps's *P. de Girard* (2d ed. 1853).

**Girard, Stephen** (1750-1831), American millionaire and philanthropist, born in Bordeaux, France. Upon the expiration of the charter of the first Bank of the United States, he bought much of the stock and the invest-

ment was profitable. During the War of 1812 he took the whole of a government loan of \$5,000,000, for which no subscriptions had been received. He was a stockholder and an influential director of the second Bank of the United States. At his death he left a large part of his fortune of \$9,000,000 to found an institution primarily for the care and training of orphans, now known as Girard College.

**Girard College**. An institution for the education of poor white male orphans in Philadelphia, founded in 1833-48 on a large bequest made by Stephen Girard. Emphasis is laid on elementary training in English and the lower branches, physical training, civics, and mechanical trades. The college is a home as well as a school, and occupies extensive buildings.

**Girardin, Emile de** (1806-81), French journalist, author, and politician, was born in Switzerland. Turning his attention to journalism, he founded the *Journal des Connaissances Utiles* (1831) and the *Musée des Familles* (1832), followed in 1836 by *La Presse*, the first fruit of his endeavor to supply the people with a cheap newspaper. In *La Liberté*, founded in 1867, he published vigorous polemics against Prussia. In 1874 he founded the journal *La France*.

**Girardon, François** (1630-1715), French sculptor, born at Troyes; worked at the decoration of the royal palace at Versailles and the Trianon palace under Le Brun. In 1657 he was admitted to the Academy of Painting and Sculpture, and nominated professor (1659). His *chef-d'œuvre* is the *Tomb of Richelieu* in the Sorbonne (Paris).

**Giraud, Henri Honoré** (1879- ), French general, hero of bitter fighting and of two wartime escapes from German prisons in two World Wars. With Gen. Charles de Gaulle, he headed the French National Committee of Liberation for five months. In April 1944 he was retired from command of the French armed forces.

**Girder**, a beam of steel or iron, resting on supports at either end, and bearing a load which may be concentrated at one or more points or distributed throughout its unsupported length. The most general application of girders is in connection with bridges, of which, when of steel or iron, they form the chief component parts. Main girders serve to carry the superstructure and moving load over the opening which is spanned; cross girders connect these transversely, and support the flooring; while in many railway bridges a third series, of small longitudinal girders, runs

throughout under the rails of each track. Girders are also largely employed to carry the floors and superincumbent walls of high modern buildings; to bear the ends of principal rafters in a series of transverse pointed roofs; and, generally speaking, to form the horizontal weight-bearing members in every variety of steel and iron structure. See also BRIDGES and STEEL AND IRON CONSTRUCTION.

**Girdlers**, small beetles of the family Cerambycidae which lay their eggs on the tips of twigs of trees. They then gnaw a deep groove around the twig behind the eggs. Thus weakened the tip of the twig breaks off in the fall or winter and falls to the ground, where the grubs hatch from the eggs, bore into the soil, and undergo their transformations, appearing as adult beetles during the following summer.

**Girgeh**, or **Girga**, town, Upper Egypt, on the w. bank of the Nile; 336 m. s. of Cairo. Nearby is a convent of the United Copts, probably the oldest in Italy. Abydos lies 10 m. s.e.; p. about 20,000.

**Girgenti**, city, Sicily, near the southern coast in the province of Girgenti. It is beautifully situated and is an ancient city with fine specimens of Greek temples still remaining. Girgenti is the successor of the ancient Akragas or Agrigentum, which was founded in 582.

**Girl Scouts**, an American organization of girls founded by Mrs. Juliette Low in Savannah, Georgia, in 1912, and incorporated under the laws of the District of Columbia in June, 1915. The purpose of the Girl Scouts is to help girls to realize the ideals of womanhood, as a preparation for their responsibilities in the home and service to the community. Its aim is to give girls through natural wholesome pleasures those habits of mind and body which will make them useful, responsible women. Girl Scouting is founded on the principles and plan so ably developed by Sir Robert Baden-Powell for England which took shape in the Boy Scout programme. The programme used by the Girl Scouts, Inc., has been changed and adapted to meet the needs of the girls of the United States.

The basic principles of Girl Scouting are found in the Promise and Laws. The Promise helps to develop loyalty toward God and Country, and the Laws serve as a simple code which every girl can put into practice in her daily life. Active members comprise Girl Scouts, Brownies, and Citizen Scouts; Associate Members make annual contributions but do not participate actively. Girl Scouts may be from 10 to 18 years of age. Brownies or Junior Scouts are from 7 to 10 years old and

below the 6th grade in school. Citizen Scouts are First Class Scouts over 16 years of age, or any other girls over 18 years. Proficiency badges are bestowed for proficiency in various subjects and a girl must be a Second Class Scout before she is eligible to receive such a badge. The activities of the Girl Scouts are many and varied, including such subjects as nature study, woodcraft, health, first aid, games, music, drama, cooking, homemaking and civics. The official organ for Girl Scouts is *The American Girl Magazine*. National Headquarters of the Girl Scouts is located in New York City.

**Girnár**, sacred hill in the feudatory state of Palitana, Kathiawar, Bombay, India, noted for its Jain temples and for a huge boulder known as the Leap of Death.

**Gironde**, department in the s.w. of France, on the lower Garonne and Dordogne, with the Bay of Biscay on the w.; area, 4,140 sq.m. It is divided into the Landes on the w., and the basin of the Gironde. The whole activity of the inhabitants is directed to the cultivation of the vine and to wine-making. Bordeaux is the capital; p. 827,973.

**Girondists**, one of the chief revolutionary parties which arose during the course of the French revolution. They first appeared in the Legislative Assembly of the year 1791, and were at first closely allied with the Jacobins. A Girondist ministry was appointed in March, 1792, which had some share in the overthrow of the monarchy, but probably were innocent of complicity in the September massacres. They were overthrown in June, 1793, and many of them were subsequently guillotined.

**Girtin, Thomas** (1773 or 1775-1802), English landscape and water-color painter, was born in London, the friend and precursor of Turner. His paintings include many views of London and Paris, scenes in northern England and many English cathedrals.

**Girton College**, an English institution for the higher education of women, founded in 1869 at Hitchin, and moved three years later to Cambridge.

**Girty, Simon** (1741-1818), a renegade leader of American Indians, was born in the present Dauphin co., Pa. From 1756 to 1759 he and his whole family were held captives by the Indians. After his release he served as interpreter and as a second lieutenant of Virginian militia against the savages. In 1776 he went over to the English side, was convicted of treason by the Pennsylvania legislature and in 1778 joined the British and led many

marauding parties of Indians during and after the Revolution.

**Gisborne, Frederick Newton** (1824-92), Canadian inventor, was born in Broughton, Lancashire, England. In 1849 he was made superintendent of telegraphs by the government of Nova Scotia, and taking up the subject of submarine telegraphy in 1852 completed the cable between Prince Edward Island and New Brunswick. He was made chief engineer of the New York, Newfoundland, and London Telegraph Co., and erected the land lines across Newfoundland in 1856. He was superintendent of the Dominion govern-

ment and man of letters, was born in Wakefield, Yorkshire. He belongs to the uncompromisingly realistic school of fiction, and has been not inaptly described as 'the historian of the middle classes.' His published works include *Demos* (1886); *New Grub Street* (1891); *The Whirlpool* (1897); *The Town Traveller* (1898); and *Our Friend the Charlatan* (1901). Besides novels, he wrote an excellent appreciation of *Charles Dickens* (1898), a collection of light and graceful sketches, *By the Ionian Sea* (1901), and *The Autobiography of Henry Ryecroft* (1903), to some extent autobiographical.



*Girl Scouts at Washington.*

ment telegraph service from 1879 until his death. He invented many appliances, connected with ocean cables, ship signals, anti-fouling composition, and gas-illumination.

**Gish, Lilian** (1896- ), an American actress, sister of Dorothy Gish, born in Springfield, Ohio. Since 1913 she has played in motion pictures, her best characterizations being in *The Birth of a Nation*, *Hearts of the World*, *Way Down East*, *The White Sister* and *The Enemy*. In 1930 she proved her ability as an actress on the legitimate stage by her interpretation of the part of Helena in Chekhov's *Uncle Vanya*, and in 1934 played in Sean O'Casey's *Within the Gates*.

**Gissing, George** (1857-1903), English

**Giulio Romano**, more correctly **Giulio di Pietro Filippo de' Giannuzzi** (c. 1492-1546), Italian painter and architect, head of the Roman school of painting in succession to Raphael, was a native of Rome. By Raphael's will he was entrusted with the completion of the frescoes in the Sala di Constantino in the Vatican. Of the series, he alone executed the *Battle of Constantine* and the *Apparition of the Cross*. He largely rebuilt Mantua, erected numerous churches, restored the cathedral, and adorned the Castello and the Palazzo del Tè.

**Giurgiu**, incorrectly **Giurgevo**, city, Roumania, on the left bank of the Danube 40 m. s.w. of Bucharest, and its port. Its fortifica-

tions were destroyed by the Russians in 1829, and in July, 1854, the Turks here defeated the Russians; p. 20,893.

**Gizeh, or Ghizeh**, vil., 1. bk. of Nile, Egypt, 3 m. from Cairo. The Nile is here spanned by a railway bridge. Five m. to the w. are the great pyramids, and in the neighborhood the Sphinx and the ruins of Memphis; p. 11,500.

**Gizzard**, a name given in zoology to a portion of the alimentary canal which is structurally adapted for the grinding of food. The grinding apparatus may, as in the crayfish, be constituted by teeth arising on the walls of the organ itself; or, as in the common fowl,

**Glacial Period** is the earlier of the two subdivisions of Quaternary time, and is known also as the Great Ice Age, and as the Pleistocene Epoch. The evidence that at no very distant date (in a geological sense) the climate of Europe, N. America, and most of the northern hemisphere was very similar to that of Greenland or the Antarctic regions at the present day, is incontrovertible. At the climax of the Glacial Period a thick mantle of ice covered a very large part of the northern hemisphere. From the high mountain plateau which forms the backbone of the Scandinavian peninsula the European ice radiated outwards over the low grounds of Northern Russia, Poland,



By De Cou, from Ewing Galloway, N. Y.

Great Glacier, British Columbia.

may be produced by pebbles, etc., swallowed by the animal.

**Gjellerup, Karl Adolf** (1857-1919), Danish author, born at Roholte; under the pseudonym of 'Epigonos' wrote his first novel, *En Idealist*, in 1879, which was followed by *De Unge Danmark* (1880), *Germanernes Lærling* (1882), and *Romulus* (1889). His works include poems, dramas, tales of travel and popular novels. In 1917 he was awarded the Nobel prize in literature.

**Glace Bay**, tn., Nova Scotia, on Cape Breton I., 10 m. e.n.e. of Sydney. There are coal mines here and sheet-metal works; p. 17,000.

North Germany, and Denmark. It filled up the basin of the Baltic and even of the North Sea. The thickness of this great mass was probably not less than 5,000 ft.

The Highlands of Scotland and the hills of the north of England nourished an independent ice sheet, which covered most of the British Islands. In the Alps the present glaciers are merely the attenuated remains of the great ice streams of the Glacial Period. The plains of Switzerland were crossed by ice fields which abutted on the Jura Mountains, and an enormous glacier occupied a large part of the Rhône Valley. Along the northern foot of the mountains and in Tyrol the extension of the

ice was correspondingly great, and on the Italian side the glaciers debouched on the Piedmont plains, and have left their terminal moraines in a great amphitheatre around Ivrea. In the Urals also, and in the Pyrenees, there is abundant evidence of a much greater extension of the ice in the Glacial Epoch than at present. It is now clear that periods during which Arctic conditions prevailed alternated with others in which the climate was mild and temperate. Professor James Geikie, who has made a profound study of this subject, has arrived at the conclusion that in Europe there were four periods of glaciation alternating with three interglacial periods. North America is extensively glaciated as far southward as the vicinity of New York city, Northern Pa., the Ohio and the lower Missouri rivers. Parts of Alaska and adjacent arctic territory seem not to have been covered by the continental ice sheet, but other intermediate regions are thickly covered with glacial debris. There were three centers of ice radiation—one in the far western Albertan region of Canada, one central just w. of Hudson Bay, and one eastern in the Labrador region. A fourth is suggested from Newfoundland as a center. Each glacial advance spread its own series of deposits of till and modified drift, which sometimes, along their contact margins, are separately identifiable. The chief of these so-called drift sheets are the Albertan, the Kansan, the Illinoian, the Iowan, and the earlier and later Wisconsin. The successive retreatal stages of the Wisconsin are marked by especially strong moraines. These are traced across great stretches of the continent and are counted by the score. It is within these morainic belts chiefly that the immense numbers of North American lakes have been formed—most of them being simply the filling of these shallow hollows left in the unevenly piled glacial till.

The history of the Great Lakes is also intimately connected with the closing stages of glacial retreat. Many extensive lakes existed then, dammed in part by the ice, that are now wholly drained—such as glacial Lake Agassiz in the Red River Valley. The Great Lakes are drift-dammed old valleys whose present drainage, simply an overflow of the margin, does not at all coincide with their pre-Glacial lines. In the establishment of new stream courses in this arbitrary fashion, occasional streams poured over escarpments, such as those in the Mississippi and Niagara rivers forming St. Anthony and Niagara Falls, two of the most interesting products of American glaciation. These two falls, originating as they did at the

immediate close of glacial occupation, constitute, in their erosion, classic geologic chronometers. Computations based upon their retreat furnish the best basis for estimates of post-Glacial time. (See NIAGARA FALLS.) In America there is no conclusive evidence of the existence of man during the Glacial Period. The effects of the Glacial Period can only be very briefly alluded to here, such as the smoothed and striated rock surfaces, the deposits of boulder clay, erratics, and gravels, the sheets of sand in the river valleys, and the moraines, kames, and eskers of the glaciated districts. The smoothed and U-shaped valleys, with lines of lateral and terminal moraines, and the frequent occurrence of crag and tail, are both widespread features of glacial origin. Many geologists hold that the deep-sea lochs of Scotland and the fiords of Norway have been in large measure produced by the erosive action of ice. *Bibliography.* James Geikie's *Great Ice Age* (3d ed. 1894) is the standard work, also his *Earth Sculpture* (1898); Bonney's *Ice Work* (1896); Wright's *Man and the Glacial Period* (1892), and *Ice Age in North America* (1889); Croll's *Climate and Time* (1885); Coleman's *Ice Ages, Recent and Modern* (1926).

**Glaciation.** The glaciers of Switzerland sometimes slowly recede at their lower ends for a period of 40 or 50 years, and when their channels are thus exposed to view, it is possible to make an accurate investigation of the characteristics of a glaciated valley. On each side lie mounds of debris, the lateral moraines, which were carried down by the glacier during its period of extension. They are often in successive ridges, one below the other, marking stages in the retreat. Crescent-shaped mounds, rounded, irregular, often discontinuous, sweep across the valley—the terminal moraines. Erratic boulders and perched blocks are strewn over the ground. Where the slopes are steep and their movement is rapid, glaciers powerfully abrade the rocks. Where the gradients are gentle and the movement slow, they tend rather to deposit what they have accumulated and to lay great masses of boulder clay and till. See books cited under GLACIAL PERIOD.

**Glaciers.** The altitude of the snow-line, or level above which the snow is permanent, varies with the latitude of the place. Where more snow falls through the winter than is melted during the remainder of the year it would go on accumulating, and would finally reach enormous thickness, were it not that the excess is drained away regularly by means

of glaciers. A glacier is, in fact, a river of snow, moving in much the same manner as a river of water, though far more slowly; and, like the latter, it draws its supply from the rainfall over the area of its basin.

Glaciers originate in snowfields, great concave basin-shaped areas in the snow-clad mountains. In the snow-fields the deeper layers gradually pass into ice, partly owing to the water which filters through the pores during the hotter hours of the summer day and freezes at lower depths, partly owing to the pressure of the superincumbent layers. This granular porous ice is known as *firn* or *névé*. It is in a condition of very slow motion, and at the lower lip of the basin the firn passes gradually into the glacier. The movement of a glacier is slowest at the sides, and most rapid in the center. This is owing to the friction of the ice against the rocky walls. For the same reason, the surface moves more rapidly than the bottom. The average velocity of the ice of Alpine glaciers varies from 50 to 120 yards in the year, or from six to fifteen inches in the day. The great glaciers of the Arctic regions have a much more rapid flow. On the glacier of Jacobshavn in Greenland a rate of movement equal to from 16 to 25 yards in a day has been recorded.

The ice itself shows obvious traces of the movement in the fissures or 'crevasse' with which it is intersected. These vary from several yards in width to an almost imperceptible crack, and they form suddenly with a cracking noise. Some of them are from 500 to 700 ft. in depth. At the upper edge of the glacier there is often a very large crevasse between the ice and the rock, known as a *bergschrund*. The distance to which the glacier will ultimately descend depends on many factors, the most important being the magnitude of the body of ice and the temperature of districts which it enters. Evaporation and melting give rise to 'glacial tables'—pillars of ice surmounted by blocks of rock. The rock protects the ice in its shade, and while the general surface sinks, the block comes to stand upon a pedestal, because the ice beneath it is preserved. These tables may be from three ft. to twelve ft. high. The appearance of the surface of a glacier depends to some extent on the season of the year. In winter it is uniformly sheeted over with snow. In summer much of the covering which has fallen during the winter has melted away; the crevasses are obvious everywhere, with their walls of blue ice. Streams fall from the adjoining slopes, and are engulfed in the crevasses making a

loud noise as they tumble into the depths of the glacier. This has given rise to the name *moulins*, or mills. Where the ice is much broken, spires and 'seracs' rise in the air, consisting of solid ice with a partial covering of snow. See GLACIATION.

Glaciers are subject to considerable fluctuations; their terminations may remain stationary for years, and then advance or recede for a considerable period. The underlying causes are probably slow changes of climate, for glaciers may be regarded as excellent slow-action thermometers. Bruckner has endeavored to prove that the observations since 1700 establish a cycle of about thirty-five years. The cause of the movement of glaciers has been discussed by Croll, Thomson, Forbes, Tyndall, Helmholtz, Drygalski, and others. It is now generally admitted that regelation is an important factor. The pressure of the accumulated snow drives the mass forward. Under pressure ice is plastic; as the pressure rises the freezing-point is lowered, the compressed ice melts till the pressure is relieved, when it again becomes solid. In this way it can adapt itself readily to the irregularities of its channel. In the Rocky Mountains only small glaciers are found south of the Canadian boundary, but in British Columbia and Alaska they are magnificently developed. For glaciers generally, see Israel C. Russell's *Existing Glaciers of the United States* (1885); Tyndall's *Glaciers of the Alps* (new ed. 1896); *Peaks, Passes, and Glaciers*, by Members of the Alpine Club; Whymper's *Scrambles amongst the Alps* (1871); Gilbert's *Glaciers and Glaciation* (1910) and Hobbs' *Characteristics of Existing Glaciers*.

**Glacis**, a term in fortification, meaning a smooth piece of ground, sloping upward, and clear of all obstacles, which must be crossed in order to enter a fort, and which the defenders of the fort can sweep with musketry and artillery fire during an enemy's advance.

**Gladbach**, or **München-Gladbach**, also **Mönchen-Gladbach**, tn., Prussian prov. of Rhineland, the chief center of the Rhenish cotton industry. It derives its name from an abbey of Benedictine monks, founded here in 972, and dissolved in 1802. The minster has a Gothic choir of the 12th century and an 8th-century crypt; p. 118,000.

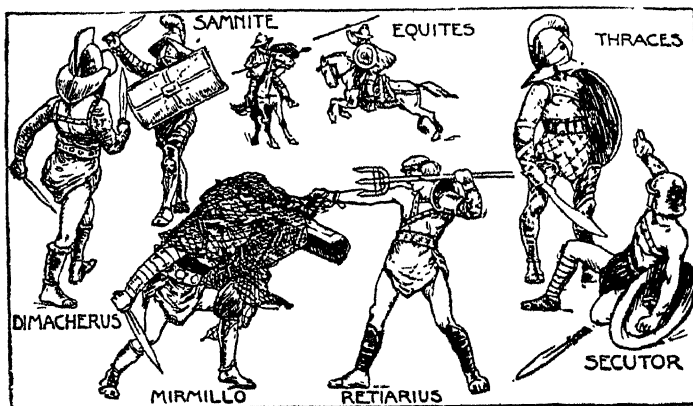
**Gladiator**, a swordsman whose profession it was to fight for the public amusement. Gladiators are said to have been borrowed by Rome from the Etruscans. They were first exhibited in Rome in 24 B.C. When a gladiator was severely wounded and defeated, the peo-

ple cried out, '*Habet*' (He has it), and he lowered his arms; then, if the spectators wished his life to be spared, they waved their handkerchiefs; but if they desired his death, they turned their thumbs down.

**Gladiolus**, a genus of hardy bulbous plants belonging to the order Iridaceæ. The brilliantly colored, gaping, funnel-shaped flowers are borne in long spikes. The varieties are propagated by separation of the young corms from their parents, and new varieties are raised from seed sown in March. To have them late

(1918) and *After Thirty Years* (1928), also a biography of his father.

**Gladstone, William Ewart** (1809-98), British statesman, was of Scottish descent, and was born in Liverpool. He was sent to Eton, and afterwards to Christ Church College, Oxford. Immediately after the first Reform Bill, Gladstone entered Parliament as a member for Newark, through the support of the Duke of Newcastle. The young member soon made his mark in the House, and was given the post of junior lord of the Treasury,



*Gladiators: Various Types of Equipment.*

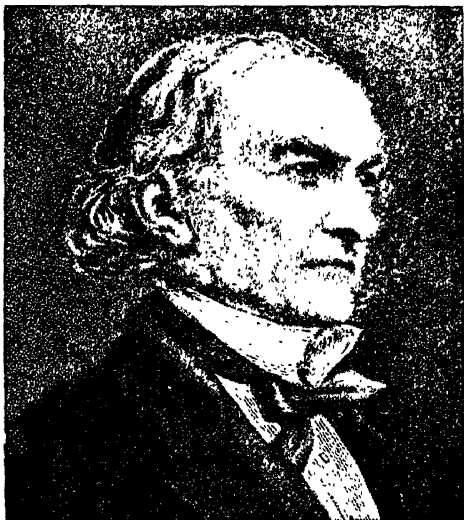
for decorating the conservatory, the corms should be potted singly in 6-inch pots, about the end of May, using a rich compost of good yellow loam, old hot-bed manure, and silver sand. They should then be plunged in a bed of very rich soil, with the rims of the pots about two inches beneath the surface. As soon as frost begins, the pots should be lifted and placed in a cold greenhouse, and brought into the conservatory as soon as the first buds begin to open.

**Gladstone, Sir Herbert John** (1854-1930), English politician, chief parliamentary whip to the Liberal party in Parliament (1899-1906), was born in Downing Street, London, the son of William Ewart Gladstone. Mr. Herbert Gladstone's membership of the House dates from 1880. He was Commissioner of Public Works (1894-5); Sec. of State for Home Affairs (1905-9). In 1909 he was appointed Governor General of United S. Africa, and in 1910 was made a viscount. During the World War, Lord Gladstone was head of the War Refugees Organization in England. He is the author of *W. G. C. Gladstone*

and the next year he was promoted to the under-secretaryship for the colonies. His first efforts were directed to the purification of the tariff. Gladstone became Colonial Secretary, 1845, but had no seat in the House of Commons. At the ensuing general election, 1847, Gladstone obtained, but not without a struggle, the long coveted honor of representing his *alma mater*.

Gladstone was selected as Chancellor of the Exchequer, 1852, but resigned over a motion of inquiry in connection with the Crimean War. For some years he remained out of office, occupying his leisure with studies on *Homer* and *the Homeric Age*, which appeared in 1858. In 1859 Gladstone joined the ministry of Lord Palmerston. In 1861 he abolished the paper duty, thus establishing a free press. On Palmerston's death in 1865, Lord John Russell was made premier, and went to the Lords, with Gladstone as leader of the House of Commons. The reform agitation was now pressed forward; the time, in Gladstone's opinion, was ripe for legislation for Ireland; and a speech, wherein he let fall the

word 'disestablishment,' revealed the path along which his mind was moving. Gladstone soon found that behind the church question lay another and more widespread grievance in Ireland—that of the land. A Land Bill, the fundamental feature of which was the substitution of partnership between landlord and tenant for absolute ownership, was passed; and, still eager to remedy the wrongs of Ireland, Gladstone grappled with university education.



William Ewart Gladstone.

(By permission of Messrs. Agnew.)

On March 12, 1874, the country was startled by the announcement of Gladstone's intention to resign the leadership of the Liberal party, and to retire into private life. He threw himself into Homeric and ecclesiastical studies with the enthusiasm which characterized all his work. After the 'Bulgarian atrocities,' Gladstone wrote a pamphlet, *Bulgarian Horrors and the Question of the East* (1876), and addressed large meetings all over the country, in which he denounced with all his old fervor the British blundering policy of bloodshed—an oratorical campaign which was ridiculed by Disraeli as a 'pilgrimage of passion.' Gladstone was returned in 1880 for Midlothian, and was, of course, compelled to resume his old position as leader. He had not been long in office when Irish affairs urgently demanded attention. Gladstone's Land Act had done good, but it was by no means a final measure, and evictions had steadily increased under it. In order to obviate these difficulties, Forster,

Chief Secretary for Ireland, brought in a Compensation for Disturbances Bill; but this, though passed by the House of Commons, was rejected by the House of Lords. The result was great dissatisfaction in Ireland, leading to the passing of a Coercion Act. Gladstone introduced a measure to deal with the whole land question on the basis of the 'three F's'—fair rent, fixity of tenure, and free sale (April, 1881). Forster meantime was busily engaged endeavoring to put down the Land League in Ireland, while Gladstone at Leeds (Oct., 1881) attacked Parnell as 'marching through rapine to the dismemberment of the empire.' On October 13 all the prominent Land League leaders were arrested, Parnell among the number. The Liberal ministry, defeated in 1885 on a budget proposal, gave place to the Conservatives.

In 1886 Gladstone came back to power with the determination to have done with repressive measures of dealing with Ireland and to conciliate the Nationalist aspirations of the people. His Home Rule Bill was defeated and the Conservatives were returned to power, pledged to maintain the supremacy of Parliament. In 1892 Gladstone became Prime Minister for the fourth time. Another Home Rule Bill was introduced, with an important alteration. The measure passed the Commons, but was rejected in the Lords. After that Gladstone took a short holiday at Biarritz, and on his return delivered (March 1, 1894) a strong speech in the Commons against the House of Lords, which proved to be the last speech in the House of the greatest parliamentarian of the Victorian era. On March 3, 1894, Gladstone resigned the leadership of the party, and spent the remaining years of his life in retirement among his books, only once coming before the public, when he delivered a great speech in Liverpool on the subject of the Armenian massacres in 1896.

In ability as a financier, and as a master of exposition, Gladstone has never been equalled. The apparent inconsistencies of his career arose from the fact that he was Conservative in sentiment but Liberal in opinion. In the early part of his life he was the hope of the 'stern, unbending Tories'; but the moment he came under the influence of Sir Robert Peel's financial genius, he was intellectually committed to Liberalism. His acceptance of free trade made a return to Conservatism impossible. Economic liberalism led to political liberalism. To Gladstone the middle and working classes are greatly indebted for the prosperity they now enjoy. See Morley's *Life*



of Gladstone (3 vols. 1903, 1911); Bryce's *Gladstone: His Characteristics as Man and Statesman* (1898); and Knaplund's *Gladstone and Britain's Imperial Policy* (1927).

**Glaisher, James** (1809-1903), English meteorologist. As founder of the Meteorological Society, he conducted extensive investigations on the humidity, etc., of the air, making many balloon ascents for the purpose, reaching in one of these, 1862, the unprecedented height of seven miles. He was the author of *Meteorology of England* (1860); *Scientific Experiments in Balloons* (1863); *Hygrometric Tables* (8th ed. 1893); *Travels in the Air* (1870); *Crystals of Snow* (1872).

**Glamis**, vil. and par., Scotland. In the parish is Glamis Castle, the seat of the Earl of Strathmore; the ancestral home of the Duchess of York. Shakespeare associates the thanage of Glamis with Macbeth by the murder of Malcolm II. in the castle, 1034. Historically the castle does not come into mention until two hundred and thirty years later.

**Glamorgan**, the most southerly co. of Wales. Its area is 516,959 ac. Between the mountains and the channel is an extensive and highly-fertile plain commonly known as the 'Garden of Wales.' The coal and iron industries are responsible for the rapid increase of the population of the country from 1801 to 1911. Barry and Cardiff are important seaports, and Cardiff is the seat of the University College of S. Wales. Cardiff is the chief town.

**Glance** (Ger. *glanz*), a term applied to a number of minerals possessing metallic lustre, such as lead glance or galena. Specular iron, also, is sometimes called iron glance.

**Glanders**. Man may contract glanders by contact with animals, usually by inoculation of a skin abrasion. The disease is capable of transmission from man to man. As in the case of the lower animals, the disease may be localized in the nose, the condition then being known as glanders, whereas in farcy the virus finds a lodgment beneath the skin. The etiological factor in both conditions is the *bacillus mallei*, in size and appearance not unlike tubercle bacillus. Generally there is great swelling of the nose, which may assume an erysipelatous type; and on the face and around the joints papules appear, which become pustular, so that they produce an appearance somewhat similar to smallpox. The chronic form, which is rare, is less serious, being more like a severe chronic coryza with occasional laryngeal symptoms. The patient

may live for months or even years, and recovery is possible.

**Glands**, a term used to describe any group of secretory cells. Such structures separate from the blood the characteristic constituents of their various secretions, and in most cases they are arranged in the form of small sacs, with contracted necks or ducts, through which the secretions are poured. Some glands, however, such as the thyroid and the suprarenals, are ductless, and their elaborated products must be absorbed by the blood or by the lymph. The liver is the largest glandular organ in the body, and weighs nearly four pounds. The peptic glands of the stomach, on the other hand, are of microscopic dimensions, consisting of simple tubular recesses lined by a secreting cellular membrane, around which the blood circulates. The salivary, gastric, and intestinal glands secrete the various fluids necessary for the digestion of food; while the kidneys and sweat glands are excretory, and pass waste products out of the circulation.

*The Lymph Glands.*—There are from 500 to 600 of these glands in the human body varying in size from those with a diameter of less than a millimeter to those with a diameter of a centimeter or more. Exact knowledge of the function of the lymph gland is incomplete. In addition to furnishing lymphocytes to the circulation, under pathological conditions the lymph glands are important in being vital mechanical filters for all lymph returning to the circulation from the body periphery, in this way forming an important part of the internal defenses of the body against bacterial invasion. The most common disease of the lymph glands is tuberculosis, known also as scrofula. Surgical removal of the infected glands may be indicated where this is possible. Tumors of the lymphatic glands may be benign or malignant; the malignant including leukemia, Hodgkins disease and lymphosarcoma. These are usually characterized by progressive enlargement of the lymph glands, anemia, terminal fever, and usually a fatal outcome. The cause is undetermined. X-ray lengthens the period of comfortable life but does not increase the expectancy. Lymphadenitis, or inflammation of the glands, is of comparatively frequent occurrence but requires little treatment unless suppuration occurs, when surgical measures are indicated.

*The Ductless Glands and Glandular Therapy.*—The ductless glands play an important part in the organism in matters pertaining to

metabolism, growth, and development. They have been referred to as the 'regulators of metabolism' (see METABOLISM). The endocrine group comprises the true ductless glands, the thyroid, parathyroids, pituitary, suprarenals, thymus, pineals, and certain glands of dual function which also possess external secretions, the pancreas, ovaries, and testicles. The spleen is sometimes classified as a ductless gland, but so far as is known, it has no internal secretion; neither is it essential to life or health. Knowledge of the function of these various organs is derived from several sources: (1) clinical pathological studies; (2) the result of experimental injury or extirpation of glands in man or lower orders; (3) the effects of administration of glands, their extracts or their active principles, on normal animals or on those deprived of the gland or with injury to the glands in question; (4) the therapeutic use of the glandular products in disease.

The following facts are definitely established: (1) Certain glands elaborate one or more active principles which affect physiological function. (2) These active principles, or hormones, are excreted into the blood stream and exert a specific effect elsewhere in the organism. (3) Disease of the gland may lead to over-function, under-function or disturbed function. (4) Replacement, under proper conditions, of the active principle lacking, leads, at times, to restoration of function. (5) Some interrelationship of function exists among the various glands. In this connection, however, there is much confusion. The more important data concerning these glands, their diseases and the part played by organotherapy, may be briefly summarized as follows.

**THE PANCREAS.**—The pancreas is a compound, tubular gland located in the upper abdomen. It serves two functions: (1) It yields an external secretion which is carried through the duct of Wirsung into the duodenum, where the contained ferments—trypsin, amylase, and lipase—participate in the process of digestion, and (2) it furnishes, from the islands of Langerhans, an internal secretion, insulin, which regulates carbohydrate metabolism and promotes sugar oxidation and the storage of glycogen, thereby lowering the level of blood sugar. Failure of insulin secretion results in the development of diabetes mellitus, characterized by faulty metabolism, the accumulation of sugar in the blood (hyperglycemia), the appearance of sugar in the urine (glycosuria), an accumulation in the body of the intermediate products of fat metabolism

(acetone, acetoacetic acid and oxybutyric acid) leading to acidosis and, at times, to coma. See DIABETES.

**PARATHYROIDS.**—The parathyroids are small, bean-sized glands, usually four in number, located in the cervical tissues in the neighborhood of the thyroid gland and presenting two types of cells, one characterized by a protoplasm which stains red with eosin. The function of the two types, however, has not been differentiated. The glands exercise a certain function in the control of calcium metabolism, and secondarily, in the excitability of the nervous system. Extirpation of these glands results in the development of tetany, characterized by increased electrical and mechanical excitability of the nerves, associated with muscle twitching and spasm, especially of the feet and hands, the latter often assuming a typical position. The low level of calcium in the blood is responsible for these phenomena, and its seat of activity is in the muscle. The parathyroid hormone (parathormone) was first extracted by Hanson and later by Gollip. It is found that the administration of parathormone will correct hypoparathyroidism. Hyperparathyroidism may result from innocent (adenoma) or malignant (carcinoma) tumors. The individual may show great muscular weakness, high blood calcium and rarefaction of bones. Surgical removal of the tumors has been attended with spectacular improvement.

**THE PITUITARY BODY OR HYPOPHYSIS CEREBRI.**—The pituitary body is a small gland situated in the sella turcica at the base of the skull and attached to the brain by the infundibulum. It consists of two parts, the anterior lobe, glandular in character, the posterior lobe or pars nervosa, and between these, the pars intermedia, which, like the anterior lobe, is developed from the early buccal lining. The hypophysis is essential to life, especially the anterior lobe, which has some influence on the size, growth and sexual development of the organism. Gigantism and acromegaly are related in some way to its over-function, and infantilism to its under-function. The posterior lobe yields an active principle which, though not isolated in chemical purity, has been obtained in an extremely active state. Some fundamental effects of this extract are: Stimulation to contraction of smooth muscle, especially the uterus; pressor action with capillary constriction, diminution in heart rate and increase in force, on circulation. The anti-diuretic action may be due to a third principle. Clinically, the liquid ex-

tract of the posterior lobe of the pituitary is utilized by subcutaneous injection, as follows:

(1) In diabetes insipidus, a disease characterized by an excessive exchange of water, it temporarily controls the three cardinal manifestations of the disease, thirst, polydipsia, and polyuria. Similar, but less constant and less marked results are obtained from its intranasal or rectal administration. Administered by mouth, it is entirely devoid of therapeutic action. (2) In obstetrics, under certain prescribed conditions, it is used hypodermically, (a) to stimulate the uterus to contraction in the second stage of labor; (b) to control atonic hemorrhage after the third stage. (3) It is also used at times for certain forms of flatulence and in postoperative paralytic ileus.

**SUPRARENAL GLANDS.**—The suprarenal glands, two in number, are located bilaterally just superior to each kidney. The gland consists of two zones, the medulla and the cortex, each with its own embryologic origin. The medulla is developed from the embryological sympathetic system, is not essential to life, and yields epinephrin as its active principle. The cortex is essential to life and its function is not fully understood. In some way, it is related to the development of the gonads and also to muscle mass. Destruction of the adrenal glands results clinically in Addison's disease, characterized by extreme asthenia, pigmentation of the skin and mucous membranes, hypotension, emaciation, and gastrointestinal disturbances. Involvement of the cortex is largely responsible. Epinephrin, the only active principle isolated, comes from the medulla and appears in the peripheral blood, probably in the dilution of approximately 1:1,000,000. It is an extremely valuable substance medically, because of certain pharmacological properties, especially its ability to contract smooth muscle innervated by the sympathetic system. In fact, its effects throughout the body are equivalent to those of sympathetic stimulation. Through stimulation of the myoneural junctions of the sympathetic system, it contracts blood vessels and raises blood pressure. It stimulates the heart, through its action on the accelerator nerve, and also increases the strength of the contraction by direct action on the muscle fibres. In the bronchioles, however, it causes relaxation. In addition it possesses a calorogenic action. This is short in duration and quite distinct from that of the thyroid.

Cannon's theory of function of the suprarenal has been a subject of controversy among physiologists for several years. It hypothe-

cates activity of the neuro-secretory mechanism in times of stress, resulting in an outpouring of epinephrin which raises blood pressure and increases blood supply to the muscles and the brain, which facilitates requisite reactions—fight, flight, etc. Clinically, epinephrin, used hypodermically, is a valuable antispasmodic in asthma. It controls itching in urticaria and in serum diseases. Surgically, it is of value in controlling hemorrhage from the small vessels, and as a stimulant in shock following spinal anaesthesia. It serves a great purpose in conjunction with local anaesthesia, as it blanches and contracts mucous membranes, prevents bleeding, and prolongs the period of anaesthesia through decreased absorption of the anaesthetic, novocaine, etc., from the local area. It has been used intravenously or by direct injection into the heart, in combination with cardiac massage and artificial respiration, to restore cardiac action in sudden heart failure where the body itself is intact.

**THE THYROID.**—The thyroid is a compound alveolar gland consisting of two lobes and a connecting isthmus situated in the lower anterior cervical region and partially surrounding the trachea. The cells are of two types, high and low columnar. The function of the thyroid is to control the rate of metabolism. This is accomplished largely through its active principle, thyroxin, a substance which was isolated by Kendall in 1914 and was shown by him to be a derivative of tryptophan containing 65 per cent. iodine. It is a catalyst that accelerates the formation of a quantum of potential energy in the cells of the organism (Plummer). It is a clear, crystalline body, insoluble in water, but rendered soluble for intravenous administration by sodium hydroxid. The thyroid itself contains 0.1 per cent. iodine, the amount in the form of thyroxin varying from 8 to 14 mg. and the daily need from 0.3 to 1.0 mg. One milligram of thyroxin is capable, in myxedema, of increasing the metabolic rate of the average patient 2.5 to 3.0 per cent.

The more common pathologic changes in diseases of the thyroid consist of colloid deposits, adenomatous overgrowth, hypertrophy, and hyperplasia. A colloid goiter is characterized by an increase over normal of colloid in the acini. The adenomatous goiter is due to formation of groups of new acini, and an encapsulated group constitutes an adenoma. Certain diseases of the thyroid are associated with marked changes in function and accompanying changes in the basal metabol-

ism. Hypothyroidism is found in myxedema and cretinism, and hyperthyroidism in exophthalmic goiter and in adenoma with a hyperfunction of the thyroid. Cretinism and myxedema are closely related, both due to decreased thyroid function. They have in common internal disturbances, mental retardation, changes in tegumental structures, mucous or edematous deposits, and a low rate of metabolism. Cretinism is congenital in origin occurring in infancy and in childhood, and is due to absence of the thyroid gland or to its destruction by disease during intrauterine life. Myxedema is due to post-natal disease, and occurs in childhood and adult life, rarely in infants. It may occur spontaneously following thyroiditis, or develop after extirpation of the gland.

Myxedema yields specifically and continuously to thyroid therapy during the period of active treatment, while many features of cretinism are beneficially affected, though permanent injury may persist due to prenatal retardation of growth. Two thyroid preparations in use are thyroxin, and desiccated thyroid, the dried gland of the sheep, a United States Pharmacopœa preparation containing 0.2 per cent. iodine. The treatment of myxedema and cretinism consists (1) in ascertaining the amount of thyroxin or desiccated thyroid necessary to raise metabolism to its normal rate, and (2) the daily administration of the amount necessary to maintain this normal rate. The former can be fairly accurately gauged in the adult by the rate of metabolism. Thyroxin, intravenously, 10 mg. in a single dose, or desiccated thyroid by mouth, 2 to 4 gm. in divided doses, will usually suffice to raise metabolism from —30 to normal in the course of a few days; 0.5 to 1 mg. of thyroxin, or 60 to 120 mg. of thyroid daily, will maintain the metabolic rate at normal. Relatively larger doses are required for children.

Thyroid therapy is also of value in reducing the size and vascularity of colloid goiter. It is utilized commonly in the treatment of obesity. The effects, although valuable, are toxic rather than physiologic in nature. It is further used at times in connection with decreased function of certain other glands, as for example, in the amenorrhea due to deficiency of ovarian function. However, its effect may be due not to specific action, but to a normal function of the ovaries incident to a general improvement in metabolism. In such mixed glandular therapy it is, as a rule, the most potent constituent. Desiccated thyroid in the treatment of myxedema and cretinism

constitutes, probably, the most brilliant success of glandular treatment.

**OVARIES.**—The ovary in the female is essential to sex life. It gives rise to the ovum, which is carried by the fallopian tubes to the uterus. The ovaries supply hormones which act (1) continuously to develop and maintain sex organs, and (2) temporarily to institute the estrus cycle and control the mating instinct. The corpus luteum and liquor folliculi probably play a part in this connection. Ovariectomy results in atrophy of the uterus and absence of the estrus cycle. Ovarian preparations have been utilized (1) in functional amenorrhea, especially in the form associated with adipose genital dystrophy; (2) to control hot flashes and other manifestations of the menopause; (3) in dysmenorrhea and genital hypoplasia, and (4) in obesity of genital or other origin. The favorable results attained in these conditions have been neither consistent nor brilliant.

**TESTICLES.**—The testicles in the male supply spermatozoa essential to fertilization of the ovum. They are also supposed to supply an internal secretion which has to do with virility. Testicular preparations have not proved of any value in medicine. Some success with transplantations has been claimed, but clinical results have been of little or no consequence, the grafts disappearing promptly in most instances.

**THYMUS.**—The thymus is an organ of fetal and early extrauterine life, which reaches its highest development in man in the second and third years. Its importance from the standpoint of its persistence, the so-called status lymphaticus in which sudden death is encountered in children during anæsthesia, or minor surgical operations, remains a moot question. Its function is not clearly understood, nor has an active principle yet been isolated.

**THE PINEAL GLAND.**—The pineal gland is thought to be a rudimentary sense organ, possibly the third eye. Its function is not understood. Thus far no hormone has been isolated from it.

**GLANDULAR THERAPY.**—The only therapy, sound in principle and universally successful in practice is that which permits of the replacement of the hormone lacking by one of the same nature. This is usually referred to as substitution or replacement therapy. Some brilliant examples may be cited: (1) thyroxin intravenously or desiccated thyroid by mouth in myxedema and cretinism; (2) the extract of the posterior lobe of the pitui-

tary hypodermically in cases of diabetes insipidus; (3) insulin hypodermically or intravenously in cases of diabetes mellitus, and (4) parathormone in cases of tetany. Only in one form of substitution therapy is the administration of the drug by mouth successful, namely, the use of desiccated thyroid in the treatment of myxedema and cretinism. So brilliant has been the success of substitution therapy in such instances that exploitation of the whole field of organotherapy has been attempted on the part of many commercial and pharmaceutical interests. However, substitution therapy is strictly limited in usefulness because of (1) diagnostic limitations in regard to syndromes accompanying disease of the single gland, and the increased difficulties attendant on the involvement of several glands; (2) uncertainty as to whether the substance isolated represents the unaltered principle of the gland concerned; (3) lack of knowledge concerning dosage because of (a) variations in composition and potency of available preparations, (b) in many instances, lack of satisfactory methods of standardization of active principles, and (c) inability to gauge the exact requirement of the organism; (4) inability to administer the preparations in a manner comparable in efficiency to that of nature. The hyperactivity and possibly dysfunction of certain glands may be overcome through surgical procedures, especially in the case of the thyroid and parathyroid, but these considerations do not fall within the scope of glandular therapy.

**Glandular Fever**, a disease characterized by malaise, fever, tenderness and swelling of the lymph glands of the neck, and abdominal pain.

**Glanvill**, or **Glanville**, **Ranulf de** (c. 1130-90), chief justiciar of England, was born in Stratford-in-Suffolk, near Saxmundham. To him is attributed the authorship of *Tractatus de Legibus et Consuetudinibus Regni Angliæ*, the first classical text-book of the English common law.

**Glärnisch**, a fine rocky mass s.w. of the Swiss town of Glarus.

**Glarus**, city, Switzerland, capital of the canton of Glarus, situated on the Linth at the foot of the Vorder-Glärnisch. The most notable buildings are the parish church, used by both Roman Catholics and Protestants, the Rathaus, and the Gerichtshaus containing a small collection of pictures. There are manufactures of cotton, tobacco, and beer; p. 5,027.

**Glasgow**, a royal and parliamentary burgh, the largest and most important city in Scotland, and the second city in size in the British Empire, is situated on the river Clyde; 46 m. southwest of Edinburgh. The chief streets are Argyle, running parallel to the Clyde; Buchanan, running e. and w.; and Sauchiehall, which leads west to Kelvingrove Park, through which flows the river Kelvin. There are numerous parks and open spaces, chief among which are Glasgow Green and the People's Palace; George Square, the finest open space in the city; the Necropolis, to the northeast; Kelvingrove Park to the w.; the Botanic Gardens; and Loch Lomond Park. Electric tramways traverse most of the principal streets and run to the suburbs, and there are underground railways. An excellent water supply is obtained from Loch Katrine.

The most important public building is the Cathedral, an Early English structure, containing a small part of a previous cathedral consecrated in 1197. It was commenced about 1238, and is now in practically the same state as at the Reformation. The University, founded in 1450 and rebuilt in 1870-84, is Early English in style. In addition to the University, there are other educational institutions, museums, art galleries. Glasgow is pre-eminently an industrial city. Its location in the center of a coal and iron district and its nearness to the mouth of the Clyde have given it unrivalled commercial advantages. Continual dredging has transformed the harbor of the Clyde into one 500 ft. wide, over 26 ft. deep, and having an acreage of 206. The quays extend nearly 9 miles; over \$40,000,000 has been expended on harbor and dock works. Glasgow early started the manufacture of woollens, and soon acquired a fame for its plaids. The first cotton mill was erected in 1792, and the manufacture of cotton is now the chief textile industry; there are also numerous calico-printing and bleaching works. Linen comes next in importance. The iron trade, introduced in 1732, is the dominant industry in Glasgow. The city contains blast-furnaces, iron and steel works and forges, engineers' and boilermakers' shops, and other machine shops; and ship-building is a leading industry at Clyde ports, over half of all British steamers being built or equipped on the Clyde.

In 1866 a Municipal Improvement Trust was constituted, and through its agency, with the assistance of the corporation, the death-rate has been greatly reduced. The worst parts of the town have been rebuilt and

opened out by the making of new streets, and model lodging-houses for men and women, public baths, and wash houses have been erected and have proved successful.

Glasgow was founded, according to tradition, by the establishment of a church on the site of the Cathedral, by St. Ninian, in the 4th century; the village was made a burgh of barony in 1180 by William the Lion, Prince David having 'restored' the see of Glasgow in 1115. From that time to the Reformation the history of Glasgow is the history of the see, and the most prominent fact in it is that Bishop Wishart, in the 13th century, took an active part with Wallace and Bruce in the wars of Independence. In 1638 Glasgow was the meeting place of the General Assembly which abolished Episcopacy. In the rebellion of 1715 Glasgow raised a regiment of 600 men for the Hanoverian king, bearing the whole expense, and dug trenches about the city. Ten years later it was disgraced by a riot, arising from the first imposition of a malt tax. In the rebellion of 1745 James Stuart the Old Pretender, quartered upon it a clan of Highlanders; and after the retreat from Derby he descended upon the city and dwelt there for ten days, compelling the people to feed and clothe his ragged host. The most notable incidents in the later history of Glasgow are a number of riots, of which the most serious were a 'meal row' of 1848, when six persons were shot by the soldiers; the failure of the Western Bank in 1857, and of the City of Glasgow Bank in 1878; outrages by Irish dynamiters in 1883; and the International Exhibitions of 1888 and 1901. A British Industries Fair held during August has been an annual event since 1918. During the Great War Glasgow was an important center for supplying essential munitions; p. 1,088,000. Consult Cleland's *Annals of Glasgow*; Sir D. Richmond's *Notes on Municipal Work*; J. H. Muir's *Glasgow in 1901*; Primrose's *Medieval Glasgow* (1913).

**Glasgow, Ellen Anderson Gholson** (1874-1945), American novelist, was born in Richmond, Va. Her books, which are chiefly keen, dispassionate studies of life in the South, include: *The Descendant* (1897); *The Voice of the People* (1900); *The Battleground* (1902); *The Deliverance* (1904); *The Wheel of Life* (1906); *The Romance of a Plain Man* (1909); *Barren Ground* (1925); *They Stopped to Folly* (1929); and *The Sheltered Life* (1932); *In This Our Life* (1941).

**Glaspell, Susan** (1882- ), American

author of plays. She has engaged in newspaper work, contributed to magazines, and worked with the Provincetown players, both as player and playwright. Her plays show keen penetration of human relationships, particularly in their portrayal of feminine psychology. Her works include *The Glory of the Conquered* (1909); *Suppressed Desires* (joint author, 1917); *The Verge* (1922); *Brook Evans* (1928); *Fugitive's Return* (1929); and *Alison's House* (Pulitzer prize play, 1930).

**Glass.** The invention of glass dates from the earliest antiquity, the oldest known specimens being Egyptian. Among the Romans the glassmaking art does not date earlier than the commencement of the empire, importations from Sidon and Alexandria having previously supplied the want of native manufacture; but there is ample evidence that its use was most extensive, and it was either blown or stamped according to the objects required. Venetian glass enjoyed for a long time the monopoly of commerce, mirrors, goblets, and cups being exported all over the world. In 1665 twenty Venetian glassworkers were brought by Colbert to Paris, where they set up the blowing of glass and the silvering of mirrors, the famous mirror hall in Versailles having been furnished by them.

It is uncertain whether the glass was made in England before the 16th century, as that mentioned may have been imported from Flanders or Venice. Window-glass was not in general use for windows till the 15th century. In America early attempts seem to have been made to establish glass works. Plate-glass was first made at Pittsburgh in 1853. At an early period the application of glass for magnifying lenses appears to have been known. Lenses are mentioned in the 12th century A.D., and by Roger Bacon in the 13th century; towards the close of which Salvino d'Armato invented eyeglasses, which were subsequently improved by Alessandro Spina. See TELESCOPE.

Glass is commonly transparent, although this property is not an essential one, since a true glass may be almost opaque, or at most translucent, even when very thin. When softened by heat it is highly tenacious, and may be easily moulded into all conceivable shapes; it welds when red-hot; at a lower heat it is plastic, and may be cut with knives and scissors; when cooled it is usually quite brittle. But molten glass can be rapidly drawn out into long threads hundreds of feet in length, and such threads retain when cooled sufficient flexibility to be woven into a silky fabric.

The chemical composition of glass differs

with the different kinds. It is essentially a silicate of soda or of potash combined with a silicate of some alkaline earth or other basic body, such as the oxide of lead. The composition of the chief kinds is as follows: 1. Window glass, including crown, sheet, and plate glass: silicate of soda and lime. 2. Bohemian crystal glass: silicate of potash and lime. 3. Flint glass, often called crystal glass or simply crystal: silicate of potash and lead. 4. Bottle glass—that is, of the common kinds: silicate of lime and alumina; with smaller quantities of the silicates of potash or soda, iron and manganese; the silicates of baryta and magnesia being also frequently present. Colored

or arch of firebricks, built so as to cover the pots and reverberate the heat downward.

Glass which contains a large proportion of flint glass cannot be made or melted in open pots, as the furnace gases would reduce some of the lead to the metallic state and discolor the glass. Similarly it is necessary to protect certain fine colored glasses, and glasses intended for optical purposes, from the furnace dust and gases. For these a covered or hooded pot or crucible with a relatively small opening is used. Modern furnaces are fed with 'producer gas' heated by 'regenerators'—a system which gives the utmost cleanliness and the most complete control of the heat. In recent years the



*Photo from Brown Bros.*

*Glasgow, Scotland: The University.*

glasses contain also one or more metallic compounds, to which they owe their color.

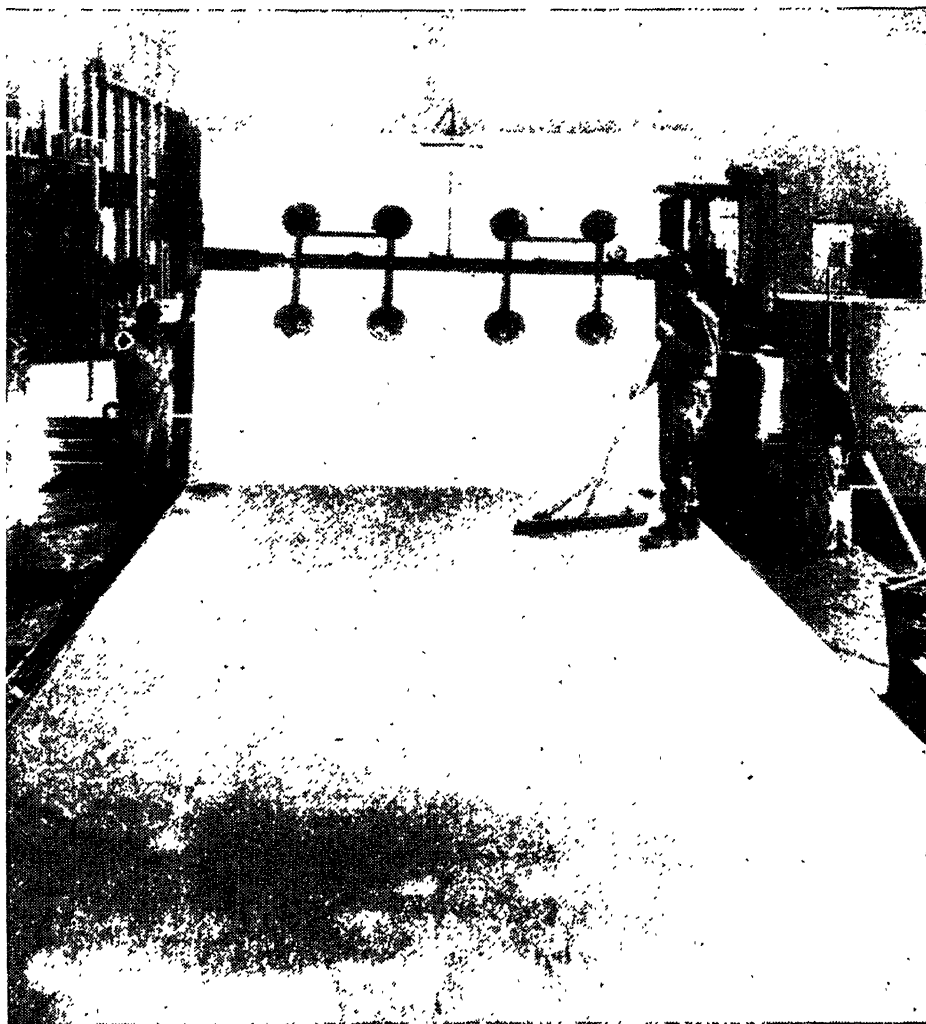
The first essential in the manufacture of glass is the proper choice of the raw materials. The principal source of silica is pure white sand; the alkali is supplied, as a rule, by carbonate of soda, sulphate of soda, or potassium carbonate; lime is introduced in the form of the carbonate (chalk or limestone rock) or as slaked lime; and lead as litharge or red lead. Other materials include barium, manganese and other 'decolorizers,' and aluminum, which forms a constituent of certain optical and opal glasses. To these materials there is always added a certain amount of broken or waste glass known as 'cullet.' The simplest system of preparing glass is the old Venetian method, in which the materials are fused in open pots or crucibles, made of some very refractory clay, set in a circular furnace with a dome

tank furnace has very largely supplanted the old type of glass furnace, especially for the making of window and bottle glass. In this type of furnace the melting pots are replaced by a large tank of fireclay in which the batch is not only melted but is also refined or separated from any impurities. A temperature of 1,400 to 1,500° C. is maintained in the pot furnace and a slightly higher temperature in the tank furnace. There are three general methods of manipulating the molten glass—blowing, casting, and pressing.

*Glass blowing* consists essentially in 'gathering' the required amount of molten glass on an iron pipe; the distension of the hot mass of glass to form a hollow sphere by blowing into the pipe; and the manipulation of this sphere to produce the desired form. The last step varies considerably with the type of article to be produced. It may include further

blowing, either with the breath alone or with compressed air; the swinging or twirling of the glass in such a way as to utilize the power of gravity and the action of centrifugal forces; and the use of hand tools and specially prepared moulds. The use of blowing machines,

spread. Two strips of iron, a little thicker than the plate is intended to be, are placed on each side of the table, and a steel or cast-iron roller is laid across, resting on these strips, which regulate the thickness of the plate, and also, by their distance apart, determine its width.



*Plate Glass blank, set in plaster, preparatory to polishing.*

in which the blowing is done by means of compressed air, has in considerable measure replaced the older methods of blowing in the last few years.

*Casting* is the method employed in the making of plate glass. The melted glass is poured onto a large table and immediately begins to

The roller, passing backward and forward at a uniform speed over the table, spreads the glass into a plate of the size required. After the glass thus prepared has been annealed, it is ground down with sand and water or emery and water and then polished.

*Pressing* consists in shaping the fused glass



by forcing it into moulds of the desired form by the action of a mechanically operated internal plunger, or, for larger work, by a weighted lever or a screw and fly wheel. It is an American process and is extensively employed for the production of small dishes, with patterns in imitation of cut glass.

*Annealing* is a slow cooling. When thick glass is allowed to cool rapidly in the air, the outer parts chill first, and an unequal tension is produced, breaking the glass in pieces. If this is not prevented, no stable glass article can be produced and the bottle will fly into pieces as the cooling goes on. It is necessary to cool glass articles off very gradually. This is done by either old-fashioned ovens or by the newer lehrs. A lehr is a long tunnel built of brick and heated to 800° or 900° F. at one end. The ware is piled up on the pan at the front end, where the heat is about 900°, and is gradually drawn away from the fire. At the back the ware is cooled down to the temperature of the air and is removed and packed. This process only takes a few hours, instead of 3 days, as in the old oven, and all the labor of piling the ware up and taking it down is obviated.

Glass for optical purposes is prepared from flint glass and is extremely difficult to make, especially when the required slabs or discs are of large size. It must be perfectly homogeneous and free from striæ. Optical lenses are ground against metal moulds of suitable curvature and then polished. Though not a true glass, fused silica itself has been introduced for scientific purposes. It is a transparent, colorless glass of the highest degree of infusibility, resistance to acids, and freedom from liability to crack or change.

Soluble Glass is a special preparation in which flint or sand is fused with an excess of alkali. Wire Glass is a combination of wire and glass extensively used in building operations, especially where fire protection is an important consideration. Cut Glass is usually prepared from flint glass. The facets are first roughly cut by holding the object against a vertically revolving iron grinding wheel, the edge of which is supplied with sand and water from a cistern above. The facets are next made smoother by a fine sandstone wheel, fed with water only, and similarly driven. The ground parts are finally polished upon a wooden wheel, supplied with a moist putty-powder or other fine polishing material. *Engraved patterns* are produced by emery powder, mixed with oil, and applied to the edges of small revolving copper discs. Hydro-

fluoric acid, which corrodes glass, is commonly used to produce etched patterns upon it, by protecting certain portions with a varnish, and allowing the acid to act upon the unprotected parts of the glass.

There are two kinds of painted or stained glass known in modern times, enamel and mosaic glass. In enamel glass proper certain fusible pigments are painted on a sheet of white or colored glass, which is then fired, and the result is a picture the tints of which even in the high lights are not wholly transparent. In this style, if any junction between two pieces of glass becomes necessary, the lead calms used for the purpose are studiously concealed by being made to run along leading lines of drapery or other forms in the picture.

The art of mosaic window-glass is especially an art of the middle ages; there is no essential difference between its processes as now carried on and those of the 13th century. The windows of that date that are left are very deep and rich in color, red and blue being the prevailing tints. They are mostly figure designs, disposed in ornamental frames; the painting is very simple, nothing but a little washed shading supporting the traced lines. Examples of stained glass, usually rather fragmentary, are common throughout England. The art has been revived, with the modern eclectic revival of Gothic architecture. Boston is now the center of stained glass work in America, and leading designers include Connick, Burnham, and Reynolds. See TELESCOPE. Consult Nelson's *Ancient Painted Glass in Europe* (1913); Bushnell's *Stained Windows* (1914); Hodkin's *A Textbook on Glass Technology* (1925). During World War II many new uses were found for glass. It was successfully used as a substitute for aluminum, copper, and steel. A new type of opaque, rigid, light-weight glass, which can be sawed or drilled, and another type that is heat and cold resistant, were developed. The use of glass containers increased enormously because of the lack of tin.

**Glass, Carter** (1858- ), American public official, an expert in government finance, was born in Lynchburg, Va. He served for 8 years in the mechanical department of a printing office, and later became the owner of the *Daily News and Daily Advance*, of Lynchburg. He served in Congress, 1902-1918, and became Chairman of the Committee on Banking and Currency and one of the leading proponents and advocates of the Federal Reserve Act. In December, 1918, he succeeded William

Gibbs McAdoo as Secretary of the Treasury but resigned in 1920 to accept the senatorship by appointment, to which he was re-elected in 1924-30 and 36. He refused the post of Secretary of the Treasury in the Roosevelt Cabinet and became a foremost opponent of the administration's financial and monetary policies.

**Glass Crab**, or *Phyllosoma*, a name given to a delicate pelagic crustacean before it was known that it is merely the young form of the rock-lobster.

**Glassites**, **Glasites**, or **Sandemanians**, a religious sect founded by John Glas in Scotland in 1725, and extended to England and America by his son-in-law, Robert Sandeman. Its teachings include the condemnation of all national establishments of religion as unscriptural; the necessity of justification by faith alone, though works are requisite as a proof and effect of faith; all assurance of salvation as presumptuous. In practice, they 'abstained from things strangled and from blood.' Any sort of association with persons not brothers in Christ, was forbidden.

**Glass Paper**, or **Cloth**, a preparation of calico or paper covered with thin glue and sprinkled with powdered glass. It is used for levelling and smoothing wood, and for polishing wood and metal.

**Glass-rope Sponge**, a siliceous sponge from the Japanese seas. The body of the sponge is ovoid and cup-shaped; the top of the cup is closed by a sieve-plate, while from the lower end extends a 'rope' of twisted strands of silica, like spun threads of glass, to anchor the sponge in the mud. It is invested for a considerable part of its length by a commensal zoophyte. See COMMENSALISM; SPONGES.

**Glass Snake**, sometimes known also as BLINDWORM, a slender lizard about two feet long found in the Southern United States and Mexico. Like the true blindworm, it is devoid of limbs, these being represented only by spikes near the anus. The tail and body are snakelike, but the head is like that of a typical lizard, and is furnished with strong teeth.

**Glasswort**, **Marsh Samphire**, or **Salicornia**, a genus of leafless herbs which grow on the seashore. The popular name, 'glasswort,' is derived from the fact that much of the soda formerly required for glass manufacture was derived from the ash of various members of this genus of plants.

**Glastonbury**, municipal borough and market town, England. It is chiefly famous for its antiquities, the most famous of which is

the Abbey founded by King Ine of the West Saxons in the 8th century and refounded and enlarged by St. Dunstan about 946. The Abbey was suppressed by Henry VIII. and all that now remains of the great Benedictine house, which once covered 60 acres, are the Abbots' Kitchen and portions of the Abbey church and chapel. The site and ruins are now the property of the Church of England.

Glastonbury was the Celtic *Ynysvitrin*, the *Avalon* of Arthurian legend, and it was hither, says William of Malmesbury, that Joseph of Arimathea founded the first Christian church in Britain. His pilgrim staff, planted on Wearyall Hill, is said to have taken root and to have grown into the famous Glastonbury Thorn which blossomed miraculously every Christmas Eve. It was cut down by a Puritan during the Cromwellian period, but grafts still exist; p. 4,326.

**Glatz**, town and fortress, Prussia, near the Bohemian frontier. The manufactures include iron goods, machinery, furniture and spirits. The chief defences are two citadels, one rising 200 ft. above the town; p. 23,971.

**Glauber**, **Johann Rudolf** (1603-68), German chemist. His researches resulted in valuable chemical discoveries. He was the first to produce hydrochloric acid from oil of vitriol and salt; and sodium sulphate, also discovered by him, bears the name of Glauber's salt. His *Opera Omnia* appeared at Amsterdam in 1661 (Eng. trans. 1689).

**Glauber's Salt** (sodium sulphate,  $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ ) occurs in transparent crystals, is bitter to the taste, and soluble in water. It is a mild but efficient laxative and diuretic, and is an important product of natural mineral waters, such as Carlsbad and Hunyadi Janos, and of the effervescing sodium sulphate. Industrially it is used in the manufacture of glass, in dyeing, and in the Le Blanc process for soda manufacture. Huge deposits of very pure natural Glauber's salt are found in Siberia and in Southwestern United States.

**Glauchau**, town, Germany, in Saxony. There are old churches and castles of the Counts of Schönberg. It is one of the busiest manufacturing centers of the country, its specialty being woolen dress stuffs, though it has also dye works, calico-printing works, iron foundries, and other industrial establishments; p. 29,000.

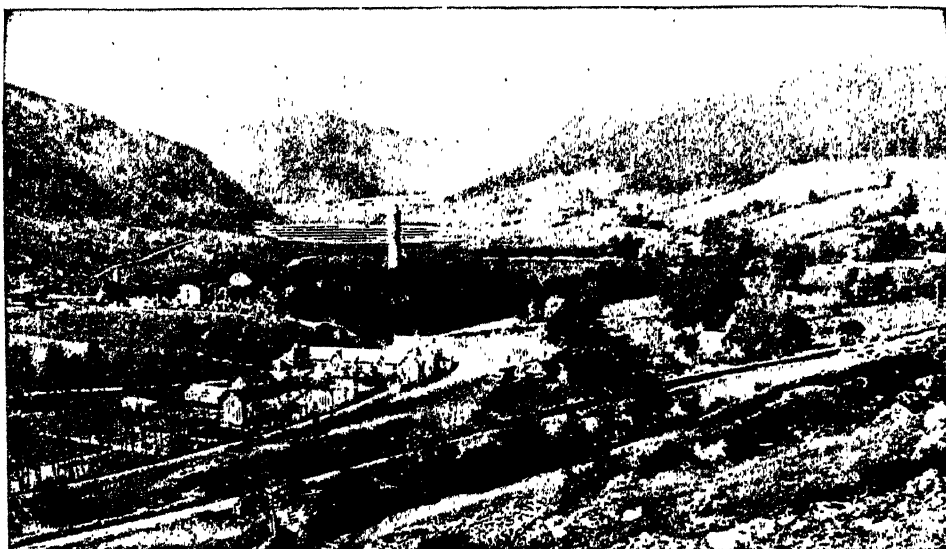
**Glaucium**, a genus of plants belonging to the order Papaveraceæ, and characterized by a two-lobed stigma, a long, two-valved, pod-like capsule, and large yellow or orange flow-

ers. The yellow horned-poppy, or sea poppy, is a European plant, generally found growing on the seashore.

**Glaucoma**, a disease of the eye in which there is increased pressure of fluid within the eyeball. In health, the continued exudation of fluid into the interior chambers of the eye is balanced by a corresponding outflow through certain veins. In glaucoma, either the secretion of the internal fluid is excessive, or the drainage is defective. The cause of the condition is unknown, but it occurs chiefly in the aged, and more frequently in women than in men. Even in the early stages of glaucoma there is impairment of sight, together with unusual tension of the eyeball. As the

**Glaucophane**, a mineral of the amphibole group (see AMPHIBOLE), usually occurring in the form of grains or plates, blue, purple, or bluish black in color. It is found in Switzerland and Italy and in California.

**Glaucus**, the name of various heroes in Greek mythology chief of whom are the following: 1. Glaucus the builder of the ship *Argo*, who went with the Argonauts as their steersman. In Jason's sea-fight against the Tyrrhenians, he alone was unwounded; but he sank to the bottom, and became a god of the sea. 2. Glaucus, the father of Bellerophon, who according to legend was torn in pieces by his own mares (which he did not allow to breed), because he despised the power of Aph



*Glendalough, County Wicklow, Ireland.*

disease advances, the optic disc becomes depressed ('cupped' is the term used), the field of vision decreases, and even objects in its center are seen indistinctly, until finally the optic nerve becomes atrophied through pressure, and sight is entirely lost. The pupil is almost constantly dilated and immobile.

**Glaucinite**, a hydrous silicate of iron and potassium, granular, dark green in color, forming little nodules. It is abundant in the green sand, and has been found to have a wide distribution over the sea bottom. It occurs most characteristically in tiny pellets, but is also found in compacted masses without grain outline. Its exact chemical composition, which has long been a subject of study, is still not absolutely determined.

rodite. 3. Grandson of Bellerophon who was one of the allies of the Trojans against the Greeks. He is famous for his conversation with Diomedes, and for his exchange of armor with that hero. He was slain by Ajax.

**Glaux maritima**, or **Sea Milkwort**, is a hardy perennial seashore plant belonging to the order Primulaceæ. It is a common little European plant, with glaucous leaves, and pink flowers in summer.

**Glazier, Willard** (1841-1905), American soldier, author and explorer. He made a canoe voyage from the headwaters to the mouth of the Mississippi, the real source of which he claimed to have discovered in 1881.

**Gleason, Frederick Grant** (1848-1903), American composer and organist, in 1877 en-

tered the Hershey School of Music in Chicago as teacher of organ and composition. He composed two grand operas, *Otho Visconti* and *Montezuma*, besides many songs and organ pieces.

**Glebe.** In England, the land assigned or possessed as part of a benefice by the incumbent, which constitutes his residence, or from which he derives his support. Glebe land was formerly inalienable, but now by statute may be sold or exchanged with the consent of the Board of Agriculture, the bishop and the patron of the benefice. It may also sometimes be mortgaged to obtain funds to repair or build a parsonage.

**Glee** (a musical form) is a composition for at least three voices, with one voice only for

deeply pinnatifid pinnæ. The fronds usually branch dichotomously.

**Gleig, George** (1753-1840), Scottish author. He contributed largely to magazines and after 1793 edited the *Encyclopædia Britannica* (vols. xiii.-xviii.), subsequently writing the two supplementary volumes (1801), almost without assistance. He wrote *Directions for the Study of Theology* (1837), a *Life and Writings of William Robertson* (1812), and other works. See *Life* by William Walker (1878).

**Gleig, George Robert** (1796-1888), British soldier and author. Appointed chaplain of Chelsea Hospital, 1834, he became chaplain-general of the forces, 1844, and inspector-general of military schools, 1846. He



*Glenroy, Inverness-shire, showing the 'Parallel Roads'.*

each part, and consists of two or more contrasted movements. It is unaccompanied and generally for male voices only. The glee is of entirely English origin; its best periods cover the latter part of the 18th and the earlier part of the 19th century. The most eminent composers of glees are Dr. Arne, Samuel Webbe, Stevens, and Callcott, founder of the Glee Club in 1783. English teachers who settled in New York established about the middle of the 19th century several Glee Clubs. But when the German element began to dominate the musical life, the cultivation of glees rapidly gave way to that of the German male quartet.

**Gleichenia**, a genus of tropical ferns, most of which have a creeping root-stock and

was the author of several novels, of which the chief is *The Subaltern* (1826), also of a *History of India* (1830-5), *Lives of Military Commanders* (1831), *Campaigns at Washington and New Orleans* (1821), biographies of Warren Hastings (1841), Clive (1848), and Wellington (1862).

**Gleim, Johann Wilhelm Ludwig** (1719-1803), German writer. He settled at Halberstadt, in 1747, where he became distinguished by his generous support of authors who hoped to see, or had seen, better days. His first work was the *Versuch in scherzhaften Liedern* (1744-5), which made him the leader of the Anacreontic school. His most important work was *Preussische Kriegslieder*

von einem Grenadier (*Prussian War Songs by a Grenadier*) (1756-7).

**Gleiwitz**, tn., prov., Silesia, Prussia, dating from the 12th century, is the seat of iron industries; it produces also bricks and glass; p. 106,000.

**Glenalmond**, the valley of the Almond, Scotland, the finest part of which is known as the Sma Glen. Near the river is Trinity College, founded in 1841 by the initiative mainly of Mr. W. E. Gladstone, with the purpose of raising a public school for Scottish Episcopalians on the model of the great English public schools.

**Glendalough**, a beautiful mountain-encircled vale in Wicklow, Ireland; celebrated for its seven churches and other ancient remains. Here, in the 6th century, St. Kevin founded a monastery, around which a 'city' grew up and flourished for several centuries.

**Glendower**, Owen (?1359-?1416), Welsh chief, claimed descent from the ruling princes of Wales, and through his mother from Llewelyn. Being wronged by Lord Grey of Ruthin, he rebelled, and assumed the title of prince of Wales. For fifteen years he maintained an unequal contest. He captured Grey and Mortimer, but refused to accept pardon from Henry V., though his wife and daughter had been made prisoners. See Thomas's *Memoirs of Glendower*, 1822.

**Glengarry**, valley, Inverness-shire, Scotland; was the home of the Macdonnells, and the last chief of the family, Colonel Alexander Ranaldson Macdonnell is said to have been Scott's model for Fergus MacIvor in *Waverley*.

**Glenlivet**, valley, Banffshire, Scotland. Prior to 1824, the glen was famous for the illicit manufacture of whisky. Since that date the Glenlivet distillery has acquired a great reputation. In 1594 the Protestants were here defeated by the Roman Catholics.

**Glenroy**, a narrow valley, Inverness-shire, Scotland, 13 m. n.w. of Fort William. It is remarkable for its three natural terraces, commonly known as 'the parallel roads of Glenroy,' at corresponding altitudes on opposite sides of the valley. The origin of the terraces has been the subject of much controversy, but the generally accepted theory is that they represent the shore lines of ancient fresh-water lakes, whose levels were reduced at long intervals by the recession or the melting of the glacial dams at the extremities of the valley.

**Glens Falls**, city, New York, on the Hudson River, which has a fall of nearly 60 ft.

at this point. Paper, pulp, wall paper, Portland cement, collars, cuffs, shirts, flour, lanterns, paper boxes, cigars, and confectionery are manufactured, and limestone and black marble are quarried in the vicinity. Glens Falls was settled in 1763 and incorporated as a village in 1837. In 1908 it obtained a city charter. Cooper's Cave, made famous by James Fenimore Cooper in his *Last of the Mohicans*, is located below the falls; p. 18,715.

**Gliddon**, George Robins (1809-57), English-American Egyptologist, was taken as a child to Cairo, where he lived twenty-three years; then he went to America and became a pioneer of Egyptology in that country. Among other books he wrote *Discourses on Egyptian Archaeology* (1841); *Ancient Egypt* (1850; new ed. 1853); *Otia Egyptica* (1849); and *Types of Mankind* (1854).

**Glider**, or **Sailplane**, motorless aircraft of the aeroplane type, designed to rise and soar on waves of air and make headway rather than merely glide through the air from a height. The basic principle is the same as that of the aeroplane, except that the glider is not lifted in the air by means of thrust of one or more revolving propellers, but by the pressure of the air itself. To start a glider, either the operator or his assistants run forward, holding the planes, until the cushion of air under the wings and the suction from above are sufficient to lift them into the air.

The first glider was designed by Leonardo Da Vinci, that wizard of the 15th century who anticipated many of the mechanical principles adopted since. Other efforts were made through the ages to build wings with which to sail and soar through the air.

Louis Pierre Mouillard, having observed that large birds in flight, while seeming at rest, could go forward against the wind without a stroke of the wings, constructed a number of gliders, built on the principle of bird wings, experimented with gliding, and in 1881 published a valuable work entitled *L'Empire de l'Air* which inspired many of the later experimenters.

Lilienthal was the first to make gliding flight a science, and it was he who first defined the value of arched wings, and the amount of pressure to be obtained at various angles of incidence. He made hundreds of experimental flights and met an untimely death while experimenting in 1886.

The Wright brothers made over one thou-

sand gliding flights preliminary to building their first aeroplane which was, in effect, their glider plus a motor and skids on which to land. They credited Otto Lilienthal and Octave Chanute with having stimulated their interest and having encouraged them.

The first ascension of duration was made by Orville Wright on Oct. 24, 1911, when he soared in a gale and stayed in the air for 9 minutes and 49 seconds. On Aug. 24, 1922, Hentzen rose in a gale to a height of close to 1,000 ft. and soared for 3 hours and 10 minutes, near Gersfeld, Germany. In 1933 Kronfeld piloted a glider and 200 pounds of mail 81 m. in 1 hour, 40 minutes, and Schmidt stayed in the air 36 hours and 35 minutes. A new international record for distance, 405 m., was made by Rastorgoeff, 1937. Kirt Schmidt's 1933 record for duration still stands, and Heinrich Dittmar, 1934, reached an altitude of 14,189 ft., almost 6,000 ft. higher than the previous record.

In 1941 Germany gave the initial impetus to a vast glider program by its successful use of that medium in the invasion of Crete. By 1943 the glider, in the form of glider trains towed by tractor or tug planes, was promising to be the long-distance freight carrier of the future.

**Glinka, Mikhail Ivanovitch** (1804-57), Russian composer. In 1836 his opera *A Life for the Czar*, the theme of which was purely national, was presented in St. Petersburg and won such success that Glinka was made imperial chapelmaster and conductor of the St. Petersburg opera. His second operatic score, *Russian and Ludmilla*, was a lesser success and Glinka henceforth devoted himself to symphonies, orchestral suites, piano-forte compositions, songs, and ecclesiastical music.

**Globe-fish**, a name applied to certain fish belonging to the families Diodontidae and Tetraodontidae, distinguished by a short, thick body with well developed fins, thick, scaleless skin armed with spines, and the power of distending a part of the oesophagus with air so that the body assumes a more or less globular form. When the body is distended with air, the spines are erected, and the fish floats at the surface, back downward, the spines forming a protection against possible enemies. Abundant in tropical and subtropical seas, they are frequently brilliantly colored. Many are highly poisonous, at least at times, while others are said to be edible. The Porcupine Globe-fish, which may reach a length of two feet, and the smaller

Spotted Globe-fish are found in the Atlantic and Indo-Pacific oceans. One or two smaller species, known as 'puffers' or 'swell-doodles,' occur along the eastern coast of the United States.

**Globes**, artificial spheres used to represent the heavens or the earth. The first globes constructed were astronomical or celestial globes, and their invention is attributed by Diodorus Siculus to Atlas of Lybia, whence the fable of his supporting the world on his shoulders. The oldest celestial globe extant is preserved at Naples. It is about six and a half ft. in circumference, and the positions of the constellations with regard to the intersection of the equator and the ecliptic fix its date at about 300 B.C. Both Strabo and Ptolemy laid down rules for the construction of globes; but no Greek or Roman terrestrial globe has come down to us. In the middle ages the Arabs constructed celestial globes of metal, one of which, made at Valencia in Spain, in 1080, is now in Florence. Famous as the oldest terrestrial globe, and as showing the knowledge of the world immediately before the voyages of Columbus, is that constructed by Martin Behaim of Nuremberg in 1492; while the Lenox globe in New York, engraved on copper, is the first post-Columbian globe (1510-12).

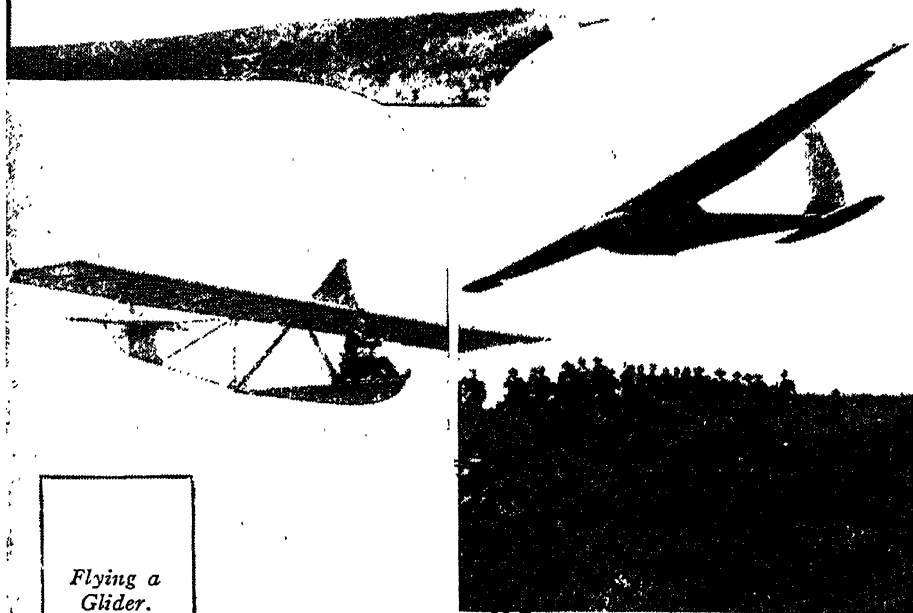
Ordinary globes are made usually of cardboard in a slightly off-spherical shape, flattened at the poles, with locations printed on. The meridians and parallels are marked. A metallic meridian, attached to the poles of the axis and graduated from the equator to the poles, surrounds the globe, and is supported by a pin on the stand, to which it may be clamped. It can slide through grooves in a horizontal circle, which is also divided into degrees, and shows the position of the sun in the signs of the zodiac on each day of the year. A properly furnished globe has also an index horarius or pointer, attached to the axis, which may be set to any meridian, and also a quadrant of altitude, which can be clamped to the meridian circle. This arc of metal is sometimes made 108 degrees long. Consult W. and A. K. Johnston's *Handbook to the Terrestrial Globe*; Stevenson's *Terrestrial and Celestial Globes* (1921).

**Globester**, the U. S. Army Air Transport round-the-world flight; the first one in October, 1945, covered 23,279 mls. in 149 hrs., 44 minutes, including 33 hours in ground time, carrying in C-54 Douglas Skymaster seven men and one woman as passengers.

**Globigerina**, a genus of Foraminifera of

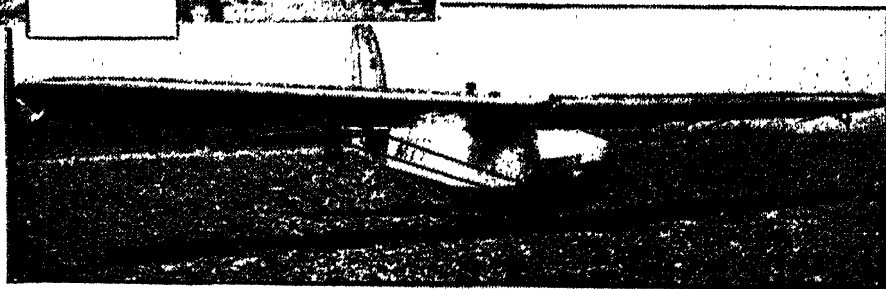


*Launching a Glider.*



*Flying a Glider.*

*Glider starting from hill.*



*Glider taking off.*

vast abundance at the surface of the ocean. So abundant are these minute organisms that, as they die, their empty shells form a continuous rain falling from the surface to the bottom, where they accumulate to form the deposit known as globigerina ooze. Globigerina ooze occurs over a vast stretch of ocean bed, both n. and s. of the equator.

**Globulins** are a class of the proteids characterized by insolubility in water, and solubility in dilute salt solutions; are precipitated by saturated salt solutions, and coagulated by heat. The principal globulins are serum globulin and fibrinogen obtained from blood, myosin from muscle, and crystallin from the crystalline lens of the eye.

**Globus Hystericus**, a sensation as of a ball rising from the chest into the throat and impeding respiration. It occurs in emotional or hysterical patients.

**Glochidium**, a name given to the larvæ found in the freshwater mussels of the family Unionidæ. When discharged into the water, the glochidia attach themselves, if possible, to the tail, fins, or gills of a fish by means of the sharp teeth, and become for a time parasitic. Subsequently a metamorphosis occurs: the little bivalve acquires the adult form, and quitting the host, sinks down to the bottom.

**Glockner, Gross**, the culminating point of the Hohe Tauern range in the Central Tyrolean Alps in Austria. It is a snowy summit, of a bell-shape, and rises to 12,461 ft., commanding a celebrated view.

**Glogau**, town and episcopal see, Prussia. It ranks as a fortress of the second class and has endured several sieges, especially in 1109, 1741, and 1814. The cathedral stands on an island in the Oder; p. 27,000.

**Glommen**, the largest river of Norway, rises in Lake Aursundsjø, near Røraas, s. of Trondhjem, flows generally s. down the falls of Sarpsfos, and empties into the Skager Rack at Frederikstad. It is navigable for the first 10 m. to Sarpsfos Falls and for about 20 m. above them. The total length is 350 miles.

**Gloss**, originally a note inserted between the lines or in the margin of a manuscript. The term is also used as an equivalent of glossary, in an interlinear translation of, or series of, verbal explanations upon a continuous text. *Glossarium*, as used by the later classical writers, meant a collection of glosses; and in more modern times the word glossary has been used for a dictionary of

words in general, as the celebrated *Glossarium ad Scriptores Mediæ et Infimæ Latinitatis* of Du Cange (6 vols. 1733-6), with the *Supplement* of Carpentier (4 vols. 1766).

In the Alexandrine period the work of the glossator was mainly confined to glossing the early Greek poets. Much later the glosses illustrating the language of Scripture were collected by Ernesti under the title *Glossæ Sacræ Heysichii*, etc. (1785-6). The term glossator is especially applied to one of the mediæval commentators on the texts of civil and canon law, when in the 12th century a school of civil law interpreters arose in Bologna.

**Gloucester**, city, England, on the Severn. It was originally a Roman camp during the Claudian invasion, and fragments of the walls still remain. Buildings include the cathedral, the 12th-century church of St. Mary de Crypt, shire hall, guildhall, prison (the first built on Howard's plan), and public baths. The city has manufactures of railway cars, implements, cutlery, engines, rope, and matches. There are also shipyards, flour mills, foundries, and chemical works.

An abbey built here by Osric in 681 was refounded in 821 for secular clergy, and in 1022 they gave place to Benedictines, introduced by Canute. A new church was begun in 1089, and dedicated in 1100. This building forms part of the present cathedral. The beautiful cloisters were completed in 1407, and the tower in 1457. Some of the stained-glass windows are of singular beauty. Triennial musical festivals are held here; p. 56,330.

**Gloucester**, city, Massachusetts, on Massachusetts Bay, 5 m. s.w. of Cape Ann, and 30 m. n.e. of Boston. It is a popular summer resort, and is much visited by tourists. A fine harbor, protected by Eastern Point and a breakwater, accommodates large vessels.

The famous fisheries of Gloucester afford employment to thousands of men. There are also shipyards, factories, and foundries. There are quarries of fine granite in the vicinity. The first permanent settlement made here in 1623 by a company of fishermen from Dorchester, England, later developed into the Massachusetts Bay Colony; p. 24,046.

**Gloucester, Earls and Dukes of**. The earldom of Gloucester was conferred on Robert, a natural son of Henry 1. The title then passed into the family of Clare, of whom Richard (1222-62), seventh earl, took a somewhat tortuous course in the civil wars of the reign of Henry III. Gilbert (1291-



1314), ninth Earl of Gloucester, fell at Banockburn. The title passed by marriage into the Despenser family.

**THOMAS OF WOODSTOCK, FIRST DUKE OF GLOUCESTER** (1355-97), seventh and youngest son of Edward III., distinguished himself by service at sea; having conspired against his nephew, Richard II., he was put to death at Calais by the king's order or connivance.

**HUMPHREY, DUKE OF GLOUCESTER** (1391-1447), youngest son of Henry IV., and known as the 'Good Duke Humphrey,' on the death of his brother, Henry V., was regent of England during the infancy of Henry VI.

**Henry, Duke of** (1900- ), third son of George V and Mary of England, was educated at Eton; captain in 10th Hussars regiment; became duke in 1928.

**Gloucestershire**, maritime county, in the western part of England, at the head of the Severn estuary. It comprises three natural divisions—the Hill or Cotswold, the Vale, and the Forest (including the Forest of Dean), west of the Severn. The county is known for its orchards, and for its dairy farms, which produce excellent butter and the celebrated Gloucester cheese. Of manufactures, the most important is that of woollens, including fine broadcloths (Stroud valley). Area, 1,243 sq. m.; p. including county boroughs, 757,668.

**Glouvet, Jules de**, pseudonym of Jules Quesnay de Beaurepaire. See **QUESNAY**.

**Glove**, a covering for the hand, with separate compartments for each finger and the thumb, made of leather, silk, wool, or cotton. The wearing of gloves dates back to an exceedingly early period. Anthropologists claim that the prehistoric cavemen used some form of protection for their hands, similar to the modern glove, and there is ample evidence of the use of gloves among the ancient Persians and Greeks and to some extent among the Romans. They were undoubtedly worn in Great Britain in Anglo-Saxon times though not to any great extent. The monks of Italy wore gloves in the 7th century, and they were in fairly general use in France in the time of Charlemagne.

In the East the transfer of a glove from a seller to a buyer marked the recognition of the purchaser's rights. In the days of chivalry a knight threw down his glove as a challenge to combat. In the Middle Ages the glove was a sign or title of investiture, and in some cases a symbol of the King's protection.

Broadly speaking, there are three classes

of gloves: leather gloves, fabric gloves, and knitted gloves. In early days leather gloves were made almost exclusively of deer and sheep skin, but at present a wide variety of skins are used, notably, kid, goat, lamb, pig, calf, reindeer, and sheep.

The cutting of gloves is done largely by machinery, according to dies or patterns. The sewing and the decoration of the back, known as 'pointing,' are also machine done in many gloves, although there is some demand for handsewn gloves. After the gloves are completely put together they are dressed into shape on metal hands kept at a uniform heat. An ordinary pair of gloves is subjected to 72 distinct operations before it leaves the manufacturer.

The fabric glove industry is rapidly increasing in importance. A great demand for sueded fabrics has produced ingenious machines which raise the nap of the cloth so that it closely resembles leather. The cutting and sewing of fabric gloves is similar to that of leather gloves. Silk and woolen gloves are made in the same way as those of cotton fabric, although different machines are employed. Knitted gloves are usually made of woolen yarn on special machines which shape the glove in the process. Consult Beck's *Gloves, Their Annals and Associations*; Smith's *Gloves, Past and Present* (1917); Ellis' *Gloves and the Glove Trade* (1921).

**Glover, John** (1732-97), American soldier prominent in the Revolution. In 1773 he was chosen colonel of a militia regiment composed chiefly of seafarers, and called during the Revolution the 'Marine' or 'Amphibious' regiment. After the battle of Long Island in August 1776, the successful retreat of Washington's army to the mainland, without loss of men or stores, was effected by Glover and his men. In December he and his regiment enabled Washington to execute the famous crossing of the Delaware at Trenton. In February 1777, the Continental Congress made Glover a brigadier-general. He was prominent in the campaign which ended in the capture of Burgoyne. Glover was a vigorous assailant of the Continental Congress for its neglect of the army, and was one of the court that convicted André of being a spy and had charge of his execution. Consult Sanborn's *General Glover and his Marblehead Regiment*.

**Glover, Richard** (1712-85), English poet, was born in London. At the age of sixteen he wrote some verses in memory of Sir Isaac Newton, and in 1737 he published his

once famous epic, *Leonidas*. His other works were the *Athenaid* (1787); *London, or the Progress of Commerce* (1739); several tragedies, including *Boadicea* (1753), *Medea* (1761), and *Jason* (1799); and a popular ballad, *Hosier's Ghost* (1739), intended to excite English feeling against Spain.

**Gloversville**, city, New York, west of Albany. It is situated in a picturesque lake district, in the foothills of the Adirondack Mountains. Mountain Lake and Sacandaga Park offer special scenic attractions. The city derives its name from its glove factories, among the largest in the United States. Mittens and woolen gloves, hosiery, silk and silk underwear, and glove and shoe leather are also manufactured; p. 23, 279.

**Glow Worm**, the name given to the beetles of the family Lampyridæ. The female of one species is the true glow worm; she is wingless and larva-like and emits a soft steady light, brightest during hot weather. The lighting apparatus occupies the last three segments of the abdomen. The male of this species is winged and is also luminous, as are the eggs, larvæ, and pupæ, but much less brilliant than the female. The exact function of the light in these insects has not been satisfactorily explained.

**Gloxinia**, the florists' name for plants of the genus *Sinningia*, tropical American plants belonging to the order Gesneraceæ. They have beautiful, many-colored, funnel-shaped flowers and velvety leaves. They require the temperature of a warm greenhouse during the summer months; but as the leaves die away in autumn, the roots may be stored in a dry place, merely protected from cold. They require a sandy soil, containing an abundance of leaf-mould and peat.

**Gluck, Alma** (1886-1938), American soprano, was born in Bucharest, Roumania, and was taken as a child to New York. She was engaged by the Metropolitan Opera Company and in 1909 made her début as Sophie in *Werther*. In 1912 she gave up the stage for concert work. In 1914 she married Zimbalist, the violinist.

**Gluck, Christoph Willibald, Ritter von** (1714-87), German composer. In 1741 he wrote his first opera, *Artaserse*, followed by several others, all of which were well received. In 1745 he went to London as composer for the Haymarket opera, but with little success. In 1762 Gluck met the poet Calzabigi. Their collaboration is embodied in *Orpheus* (1762), *Alceste* (1767), and *Paris and*

*Helen* (1769), the first of the so-called 'reform' operas.

In 1774 Gluck produced in Paris his opera *Iphigenia in Aulis*, which was a great success and led to a spirited controversy between the 'reformers,' or 'Gluckists,' and the defenders of the traditional style, led by Piccini. His greatest service to music was his transformation of opera from a mere vehicle for the singers' voices to dramatic expression in music. It has been said of him that to his Italian training he owed melody; that France taught him the value of declamation in recitative; that Germany gave him harmony, orchestration, and the philosophical mind which made him a musical reformer. Consult Ferris' *Great Musical Composers*; Newman's *Gluck and the Opera*.

**Glucosides**, a group of substances found almost exclusively in the vegetable kingdom, which, by the action of dilute acids or certain enzymes, such as emulsin or myrosin, are resolved into sugar and some other compound not in the class of carbohydrates. The sugar formed is usually glucose. The majority of glucosides are colorless, crystalline, neutral compounds, usually soluble in water and alcohol and sparingly so in ether. They are bitter in taste and have a therapeutic action, being much used in pharmacy. Glucosides may be obtained synthetically but most of them are found in nature.

**Glue**, an adhesive substance used especially in the wood-working industries for joining two or more sections together, and obtained by boiling animal substances in water to extract the gelatine. The chief commercial varieties of glue are skin, hide or leather glue, bone glue, and fish glue. In the manufacture of glue from hides or skins the first step is treating the stock with weak solutions of lime with the threefold object of dehairing, of swelling the pores to a condition ensuring extraction of the maximum amount of glue, and of getting rid of all deleterious matter. After liming, the stock is washed, squeezed dry by a roller, and then subjected to boiling or extraction. In order to obtain the proper amount of heat the extraction of the glue is often carried out in vacuum evaporators. After extraction the glue liquor is conducted into pans about a foot deep; these are placed in cooling rooms where the liquor becomes a tenacious jelly. These jelly bricks are then cut into slices, dried slowly, and in most cases broken into small irregular pieces known as flakes, and packed for market.

Bone glue is prepared in practically the

same manner as hide glue. Fish glues, with the exception of isinglass, which is prepared chiefly from the bladder of the Russian sturgeon, are in the form of heavy solutions or pastes. They are powerful adhesives made by boiling the skins of fish and attempting to disguise their fishy odor by the use of essential oils. The substance generally known as liquid glue contains no true glue whatever. Flexible glue, used by bookbinders, is a mixture of glue, glycerine, and water. Consult Lambert's *Glue, Gelatin and Their Allied Products*; Bogue's *The Chemistry and Technology of Gelatine and Glue* (1922); Alexander's *Glue and Gelatin* (1923).

**Glumes**, the scaly bracts or envelopes which surround the flowers of sedges and grasses.

**Gluten**, a grayish-brown adhesive, plastic, nitrogenous substance, obtained from wheat flour by kneading it in a stream of water until the starch is washed away. The best wheat flour yields 10 or 11 per cent. of gluten, which ultimate analysis shows to contain from 15 to 18 per cent. of nitrogen; inferior qualities of flour give 8 or 9 per cent. of gluten, and oats, rye, and barley scarcely any. The food value of gluten is high and its mechanical action during the manufacture of bread, in hindering the escape of carbon dioxide, renders wheaten bread lighter than that prepared from rye and other flours.

**Glutton**, or **Wolverine** (*Gulo luscus*), a member of the weasel family, remarkable for its large size (length 30 inches or more). The name wolverine is applied to the animal in America. It is a clumsy, heavily built animal, with short thick limbs, powerful claws, and thick bushy tail, the dusky fur being somewhat coarse but long and thick.

**Glycerin**, or **Glycerol**,  $\text{CH}_2\text{OH}\cdot\text{CHOH}\cdot\text{CH}_2\text{OH}$ , is a colorless, viscid, odorless fluid of sweet taste, soluble in water and alcohol, but insoluble in ether and chloroform. It was discovered by Scheele in 1779; and can be prepared synthetically, but is obtained by the hydrolysis ('saponification') of the fats and oils. This is carried out on a large scale in the manufacture of soap, but the glycerin thus obtained is mixed with impurities. Glycerin is much more simply obtained in the preparation of fatty acids for candle-making, by heating fats under pressure with water that contains a small quantity of lime, the liquor produced, or 'sweet water,' merely requiring evaporation to yield a product available for many purposes. It is very hygroscopic, mixes with water in all

proportions, and acts as a solvent for many substances. It is used as a preservative for small anatomical specimens; in the manufacture of perfumes and nitro-glycerin; as a lubricating agent; as a freezing deterrent; and in numerous other ways.

**Glycocol**, or **Glycine**, is amidoacetic acid,  $\text{CH}_2\text{NH}_2\text{COOH}$ , a sweet, crystalline body (m.p.  $232^\circ\text{C}$ ; sp. gr. 1.16), very soluble in water, but insoluble in alcohol that is prepared by the action of ammonia on chloroacetic acid. It occurs in some animal fluids.

**Glycogen**, animal starch ( $\text{C}_6\text{H}_{10}\text{O}_5$ )<sub>n</sub>, occurs chiefly in the liver, and is a white amorphous, tasteless powder, which dissolves in water, forming an opalescent solution. It gives a red color with iodine; is converted to dextrose by boiling dilute acids, and to maltose by ferments.

**Glycol**, or **Ethylene Alcohol**  $\text{CH}_2\text{OHCH}_2\text{OH}$ , is the first and best known of the series of diatomic alcohols. It is prepared by boiling ethylene bromide with potassium carbonate solution, and is a viscid, sweet, colorless liquid, sp. gr. 1.13, and b.p.  $197.5^\circ\text{C}$ .

**Glycosuria**, a pathological condition characterized by the presence of sugar in the urine. It occurs in diabetes mellitus, and occasionally in the urine of gouty people, more especially if they are elderly and corpulent, and such cases may develop diabetes.

**Glyptodon**, an extinct fossil mammal, the remains of which have been found on the pampas of South America, and less frequently in the U. S. It belonged to the Edentata, and resembled a gigantic armadillo.

**Gmelin**, German family of chemists and naturalists, including Johann Georg (1709-1755) scientific traveler; Samuel Gottlieb (1744-1774) botanist and traveler; Johann Friedrich (1748-1804), author of a botanical dictionary; and Leopold (1788-1853), chemist.

**G-Men**. (Government men), a popular term applied to agents of the Federal Bureau of Investigation. (see HOOVER, JOHN EDGAR, and KIDNAPING).

**Gnat** is a name given in Europe to the members of the mosquito family, Culcidae, but in America is applied mainly to the members of the related family Chironomidae or midges, as the buffalo-gnat of the s.w., and the forest gnat or 'black fly' of the northern woods.

**Gnatcatcher**, a small insectivorous bird of the American subfamily of warblers (Sylvidae). They are slender birds, grayish in

color, the best known being the blue-gray gnatcatcher of the eastern United States. The nest is built high on a tree limb, the small cup-like structure covered with lichen giving the appearance of an excrescence on the limb.

**Gneditsch, Nikolai Ivanovitch** (1784-1833), Russian poet, born at Poltava. He is remembered chiefly for his translation of the *Iliad* (new ed. 1884) into hexameters, after twenty years of labor, in 1829.

**Gneisenau, August Wilhelm Anton, Graf Neithardt von** (1760-1831), Prussian field-marshal. Both as a member of the commission for the reorganization of the Prussian army, and as a commander at the battle of Leipzig (1813), he rendered valuable service, which he crowned by his successful direction of the Prussian force, as chief of staff under Blücher, in the campaign of Waterloo. Gneisenau was made governor of Berlin in 1818 and field-marshal in 1825. He died at Posen in 1831, while commanding the forces engaged in suppressing the Polish rebellion.

**Gneiss**, crystalline metamorphic rocks which consist typically of quartz, feldspar, and mica. In place of mica some gneisses contain hornblende; others contain graphite; or two or more of these minerals may be present. The 'gneissose structure' of the rock depends on the distribution of the component minerals, which are arranged in parallel or wavy bands or folia. Gneiss is very typical of the most ancient rock masses which are exposed on the earth's surface, and covers wide regions in Northern Europe, N. America, Switzerland, Brazil, India, Australia, and China.

**Gneist, Heinrich Rudolf Hermann Friedrich von** (1816-95), German jurist and educator who used his professional influence in promulgating ideals of government. An admirer of England, he dreamed of unity between the two great Teutonic countries, England and Germany.

**Gnesen** (Polish *Gniezno*), tn., Prussia. The cathedral dated originally from the end of the 9th century, but was rebuilt in 1760-90. Gnesen has been an archiepiscopal see since the year 1000, and down to 1320 was the place where the kings of Poland were crowned; p. 25,855.

**Gnome**, a name applied by the Cabbalists and Rosicrucians to an order of subterranean beings supposed to guard treasures and mines. Paracelsus (16th century) makes gnome — pygmæi; and the gnomes of popular belief are always dwarfs. The Teutonic

kobold, the Scotch Nis, the English Boggart, and the Brownie. See GOBLIN.

Consult Keightley's *Fairy Mythology* (1828, 1870), which gives an account of the traits ascribed to the 'little people' of various north countries and recounts many tales of their activities.

**Gnome**, a Greek word for judgment of thought, and in the plural, sayings or maxims—hence an aphorism or concise statement of a general truth. The rise of the Gnomie poets marks the dawn of moral philosophy in Greece.

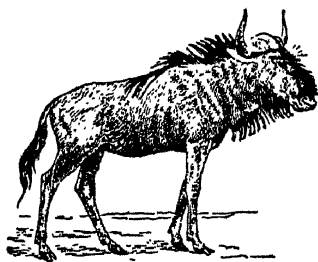
**Gnosticism**, a widespread and much diversified heretical movement which disturbed the Christian church during the first three centuries. To many of the eagerly speculative minds of the time, already imbued with syncretistic tendencies, there appeared a good prospect of winning a valid and satisfying philosophy of life from the interfusion of the older systems and the new religion. The project was tried, and the resultant amalgamation of Greek philosophy, Oriental theosophy, and speculative Christianity was designated Gnosticism. Our knowledge of Gnosticism is devised exclusively from the partisan accounts of its opponents. The creative period of Gnosticism expires with the 2d century, but its influences persist for another hundred years.

It must suffice here to enumerate certain general principles more or less recurrent in all the forms. Such are, for example, the view of Christianity as a speculative cosmology rather than as a dynamic of an ethico-spiritual life, and of salvation as to be obtained by acceptance of its supposed esoteric elements rather than by practical faith in its founder; the distinction between the heavenly Christ and the historical person Jesus in which he manifested himself; the division of men into three grades—the pneumatic or spiritual, the psychic or animal 'soulish,' and the hylic or material; finally the tendency to asceticism on the one hand and unbridled libertinism on the other, springing both from the belief that the sensuous world is nought. The influence of all this upon the church was very great, though mainly indirect. The early fathers were not blind to its intellectual incoherence; they saw at once that, whatever it might be, it was not Christianity. This forced the orthodox party towards the important step of drawing up a canon of Scripture, to serve as an authoritative standard for the church's faith and practice. But when the church felt compelled to make

a beginning with a system of dogmatic theology, over against the gnosis of the heretics she set up a gnosis of her own.

The only complete Gnostic production extant is the *Pistis Sophia* (trans. from a Coptic ms. into Latin by Schwartz, and edited by Petermann, 1853; Eng. trans. 1896); fragments in Hilgenfeld's *Ketzergeschichte* (1884). Justin, Irenæus, Hippolytus, Tertullian, Epiphanius, are our main sources.

**Gnu**, or **Wildebeest**, the name given to two species of antelope belonging to the genus *Connochaetes*, animals of bizarre form, presenting some superficial resemblance to buffaloes. Horns are present in both sexes, the withers are higher than the haunches, the head is broad and short, and the mane erect, the tail long, and furnished with hairs



*Brindled Gnu.*

throughout its length. The white-tailed gnu is confined to South Africa, and is now nearly extinct; and the brindled gnu occurs in East Africa. Both associate closely with zebras, and are remarkable for their queer evolutions and antics when excited by the fear of an enemy or the presence of anything strange, as a hunter's wagons. See Schilling's *Flashlights in the Jungle* (1906).

**Goa**, Portuguese settlement on the w. coast of India, since its conquest by Albuquerque in 1510. Its archbishop is the head of the Roman Catholic Church in the East, and more than half the population are Roman Catholics. The capital, Noya Goa or Panjim, is a picturesque town.

**Goajira**, peninsula in Colombia, S. America, between the Caribbean Sea and the Gulf of Venezuela. The Goajira Indians are a sturdy, independent race, almost untouched by civilization.

**Goat**. Goats, together with sheep, form the caprine section of the Bovidae. In the goats the horns are flattened from side to side, and either curve backwards or are spirally twisted. The chin bears a more or less dis-

tinged beard, and the males have a singularly strong, rank smell. Like sheep, goats are typically mountain animals; but they are partial to the shoots and leaves of shrubs and trees, while sheep confine themselves more strictly to grass. As very typical examples of wild goats may be mentioned the ibex of the Alps, Himalayas, mountains of Arabia, etc.; the Persian goat, bezoar goat, or paseng, the parent of the domesticated goats; the tur of the Caucasus; the Spanish goat, or ibex. Goats are useful principally for their milk, as a good she-goat will give from three to six pints of milk per day of similar taste to cow's milk. The Nubian goat is said to yield as much as from three to four quarts per day of milk of superior richness. The skins of goats are utilized for gloves and in the production of leathers of fine texture and high value used in book-binding, etc.

The domestic goat is represented by many sub-varieties, which differ in the length of the hair, in color, and in the shape of the horns. In the short-haired class the coat is thick and close, with an undergrowth of woolly character. Both sexes are horned, but in the male the horns are more developed. The color is either white, gray, fawn, or black. The long-haired goat is more frequently swarthy red, although occasionally white or pied. The horns are large, corrugated, and pointed, and rise close together in parallel lines. The coat is shaggy and the head large and ugly. The Angora and the Kashmir goats both yield hair of beautifully silky texture, and both carry a second quality of coat which resembles wool. In the Angora goat the woolly portion of the coat is outside the hairy covering, but in the Kashmir goat the wool is next the skin. The Nubian goat carries short, black, twisted horns, the ears are pendulous, the legs long, and the coat of the female is extremely short. The Maltese goat is generally hornless, and is cream-colored. The Syrian goat has very long ears and very long hair, and its horns are erect and spiral.

Goats are not much raised in the United States, except along the Mexican border, as they are less profitable than sheep or cattle. The qualities of the Angora as farm-stock are explained in Farmers' Bulletin No. 137, issued by the U. S. Department of Agriculture in 1901.

**Goat-moth**. A common European moth of the family Cossidae, whose caterpillars bore into the bark and growing wood of forest and shade trees, doing great damage.

**Goat's Beard.** A naturalized weed belonging to the genus *Tragopogon* (Chicoriaceæ). It has a yellow, dandelion-like head, but linear-lanceolate, keeled leaves. The early-closing habit of one species has earned it many quaint names, such as 'noon-flower,' 'Johnnie-go-to-bed-at-noon.' The long, tapering root of the purple goat's beard is the vegetable called 'oyster-plant,' or 'salsify.'

**Gobelins,** a French family which gave its name to the well-known manufactory of tapestry at Paris. Gilles Gobelin established dye-works in the 15th century, and soon after a tapestry factory was added. The industry, renewed at the restoration of the Bourbons received a fresh impulse between 1870 and 1880 owing to the use of special designs prepared by leading artists, in place of the former method of copying pictures. The factory gives its name to a shade of blue (known as 'Gobelin blue') appearing frequently in the tapestry. Another manufactory of the tapestry is in operation at Beauvais. See Gerspach's *La Manufacture Nationale des Gobelins* (1892); Hunter's *Tapestries* (1912).

**Gobi Desert, the Shamo or Han-hai** of the Chinese, stretches continuously from the Pamirs to the Great Khingan range and the w. frontier of Manchuria. The w. part is usually known as the Takla Makan Desert. A sandy soil, heavily charged with alkalis is the general characteristic. The Chinese term 'sea of sand' is really applicable only to certain areas; even in the middle of the desert, a certain amount of thin herbage is often to be found. The Great or Eastern Gobi is studded with loftier masses of land of rocky formation.

Nearly the whole of this vast region (the Gobi in its widest sense) has inland drainage. Of the inland waterways by far the most important is the Tarim, in the Takla Makan region (Chinese Turkestan). The climate is severe for the most part; the rainfall barely sufficient for pasturage. The total area must be at least 300,000 sq. m.; extreme length about 1,800 m.; average breadth about 400 m. Caravan routes cross the desert. To Pievstov, Bogdanovich, and more recently to Dr. Sven Hedin, we owe our most valuable and accurate information of these regions. Explorations of the desert have continued since Marco Polo's trip in 1275. The most notable of the recent explorers is Roy Chapman Andrews of the American Museum of Natural History in New York, who has discovered the most remarkable fossil deposits known to the world.

**Goblin,** an imaginary being supposed to haunt dark or remote places. The lutin or goblin of Normandy hardly differs from the domestic spirit of Scandinavia and Germany. The German kobold has a similar derivation and is the same being as the Scottish brownie and English hobgoblin. The kobold lives with families he approves of, first putting them on trial by bringing chips and sawdust into the house, and throwing dirt into the milk-vests. If this is not resented he proves a good friend. Robin Goodfellow is a domestic spirit or goblin distinguished by roguery and sportiveness. See GNOME.

**Goby,** a fish of the genus *Gobius*. All are small fish, carnivorous in habit, and haunting rocky coasts, for which they are specially fitted, owing to the fact that the pelvic fins form a suction disc, enabling the fish to cling to rocks, and so withstand the force of the waves. Some three hundred species have been described, but they are little known in the United States.

**God. See Theism.**

**Godard, Benjamin Louis Paul** (1849-95), French musician. He composed several operas, pianoforte works, and violin sonatas. besides chamber music and many songs, including *Ninon* and *Je ne veux pas d'autre chose*, which became very popular. His chief works are the dramatic cantata *Le Tasse* (1878), and the operas *Pedra de Lalamea* (1884), *Jocelyn* (1888), *Dante* (1890), *La Vivandière* (posthumous, 1896); also *Symptome Légendaire*.

**Godavari,** the longest river in the Deccan, India; discharges by seven mouths into the Bay of Bengal. The Godavari is one of the twelve sacred rivers of India, and is about 900 m. in length.

**Goddard, Arabella** (1836-1922), English pianist, famous for her interpretations of Beethoven's Sonatas. She made her début in London in 1850, and afterwards played with success on the Continent; and from 1873-6 made a tour through the U. S., Australia, India, and China. Among her last appearances was that at Sir Arthur Sullivan's concerts at the Paris Exhibition of 1878.

**Goddard, Henry Herbert** (1866- ), American psychologist, distinguished for his work with feeble-minded, especially at Vineland, N. J. Since 1922 he has been professor of abnormal and clinical psychology at the Ohio State University. His works include *The Kallikak Family* (1912); *Feeble-mindedness* (1914); *Psychology of the Normal and Sub-*

normal (1919); *Two Souls in One Body?* (1927).

**Goddard, Pliny Earle** (1869-1928), American anthropologist, associated with the American Museum of Natural History from 1909 until his death. Among his works are *Life and Culture of the Hupa* (1903); *The Morphology of the Hupa Language* (1905); *Kato Texts* (1909); and *Indians of the Southwest* (1913).

**Godefroy, Frederic** (1826-97), French lexicographer, born at Paris, compiled a *Lexique Comparé de la Langue de Corneille et*

tion of Edmund Halley in London. Halley described them in a paper read before the Royal Society in 1731. In the following year the Royal Society granted Godfrey a reward of £200, in appreciation of his valuable services to science.

**Godfrey of Bouillon** (c. 1061-c. 1100), one of the leaders of the first crusade, was born at Baisy in Brabant. Leading to Palestine one of the six armies of the first crusade, Godfrey distinguished himself especially at the siege of Jerusalem, and in 1099 was elected king of the city. He died soon after in-



Goats.

Upper Left, Arabian ibex (*C. Sinaitica*); Upper Right, Markhor (*C. Falconeri*); Lower Left, Kabul variety of Markhor; Lower Right, Persian wild goat (*C. hircus aegagrus*).

*de la Langue du XVII<sup>e</sup> Siècle en Général* (1862), and wrote *Histoire de la Littérature Française depuis le XVI<sup>e</sup> Siècle* (9 vols. 1859-81) and *Dictionnaire de l' Ancienne Langue Française* (10 vols. 1880-92).

**Godfather and Godmother.** See **Sponsors.**

**Godfrey, Thomas** (1704-49), American mathematician. He was born in Philadelphia in humble circumstances and followed the trade of a glazier. He early showed great aptitude in mathematics and taught himself all branches of that science. In 1730 he made some important improvements in Davis's quadrant, which were brought to the atten-

tion of Edmund Halley in London. Halley described them in a paper read before the Royal Society in 1731.

**Godiva, Lady, or Godgifu**, patroness of Coventry, England. Wife of Earl Leofric of Mercia from about 1040, she induced him to found a Benedictine monastery at Coventry in 1043. The first chronicler to mention the famous Coventry ride is Roger of Wendover, who says that when Godiva begged her husband to relieve the town from burdensome tolls he made an impossible condition—that she should ride naked through the market when the people were assembled. This nevertheless she did, screened by her luxuriant hair. Later versions omit the crowded mar-

ket and add miracles; the Percy folio ballad says that Godiva ordered all persons to keep within doors, and that nobody saw her. The story has been gracefully retold by Leigh Hunt, and in noble verse by Tennyson.

**Godkin, Edwin Lawrence** (1831-1902), American editor and publicist, born in Ireland. During the Crimean War (1854-6) was field correspondent for the London *Daily News*. In 1856 he came to the United States and during the Civil War he was again correspondent for the *Daily News* and an editorial writer on the New York *Times*. In 1865, with Wendell P. Garrison, he established *The Nation*, a literary and political weekly review, which owed its success largely to the trenchant quality, strength, and humor of his editorial writing. In 1881 he became an editor of the New York *Evening Post*, after two years becoming editor-in-chief.

Godkin's merciless and persistent attacks upon what he considered sham, political, financial, and social, and in particular his castigation of the methods and men of Tammany Hall, led to reprisals and many libel suits. His writings include several collections of his essays from *The Nation*, *Evening Post*, and *Atlantic Monthly*, published under the titles *Reflections and Comments*, *Problems of Modern Democracy*, and *Unforeseen Tendencies of Democracy*; *History of Hungary* (1856); *Government* ('American Science Series,' 1871). Consult Ogden's *Life and Letters of E. L. Godkin* (1907).

**Godolphin, Sydney, Earl of** (1645-1712), English statesman. His first diplomatic mission was to negotiate in 1678, between the Duke of York and the Prince of Orange, a proposal (which was unsuccessful) for combined war against France. In the following year he was appointed Lord of the Treasury. On the accession of Queen Anne (1702) he was made sole Lord High Treasurer. The personal friend of Marlborough, Godolphin steadily supported the great General all through the war, enabling him by his thrifty and able management of the finances to conduct one brilliant campaign after another without suffering embarrassment from lack of supplies. When the Marlboroughs fell from favor, Godolphin fell with them, and on Nov. 8, 1710, he was curtly dismissed by Anne. Consult Hugh Elliot's *Life of Earl Godolphin*.

**Godowsky, Leopold** (1870-1938), Polish-American pianist. After concert tours as a boy pianist, he studied for several years with Saint-Saëns in Paris. In 1895-1900 he was di-

rector of the pianoforte department of the Chicago Conservatory; and in 1909 was appointed director of the Imperial Royal Meisterschule for Piano at Vienna. He was a pianist of much technical brilliancy, and as a composer was noted chiefly for his arrangements of classical pianoforte pieces, making them of extraordinary difficulty. He was the composer of 60 studies on Chopin Etudes; *Renaissance* (24 pieces); *Walzermasken* (24 compositions); besides compositions for the violin, piano pieces, and songs.

**Godoy, Manuel de, Duke of Alcudia** (1767-1851), Spanish statesman. He was by Charles IV. successively made duke of Alcudia, generalissimo of the forces, and Prime Minister (1792), and received the title of 'Prince of the Peace' for his share in arranging the treaty with France, concluded at Basel in 1795. His power began to decline in 1807. After the death of Charles IV. he lived in Paris, pensioned by Louis-Philippe. In 1847 his return to Spain was permitted, and his titles, together with great part of his wealth, were restored. His *Memoirs* were published in 1836.

**God Save the King.** See **National Anthems**.

**God's Truce** (*Treuga Dei*) was the name given to the successful effort by the Christian Church to mitigate the evils of the anarchy into which Europe fell after the dissolution of Charlemagne's empire. The movement originated, 1027, in the S. of France. The main features were these: Peace was to last from Wednesday evening to Monday morning in each week, also during Advent and Lent, and on certain of the principal holy days of the church; the punishments for contumacy and disobedience were fines, banishment, and excommunication; protection was specially extended to women, pilgrims, priests, travelers, merchants, and agriculturists, and also to farm implements and live stock.

**Godunoff, Boris.** See **Boris Godunoff**.

**Godwin** (c. 990-1052), Earl of the West Saxons, was the father of the last English king of native stock, Harold. Under the rule of Canute he became an earl (1016). In 1042 he took the foremost part in raising Edward to the English throne, and was rewarded by the marriage of his beautiful daughter Edith to the English king. His son Harold was for a few months Edward's successor on the throne. Consult Green's *Conquest of England*.

**Godwin, Mary Wollstonecraft** (1759-97), English author. Her *Vindication of the Rights of Women*, published in 1792, was an



able plea for the equality of the sexes and the better education of women. In the same year she met Captain Gilbert Imlay, an American merchant, to whom she bore a daughter. In 1797 she married William Godwin; their daughter became Shelley's second wife. She also wrote: *Answer to Burke's Reflections on the French Revolution* (1791); *Historical and Moral View of the French Revolution* (1794); *Letters Written During a Short Residence in Sweden, Norway, and Denmark* (1797); *Letters to Imlay*.

**Godwin, Parke** (1816-1904), American journalist and author. In 1837 joined the editorial staff of the *New York Evening Post*. In 1842 he married the eldest daughter of William Cullen Bryant, the editor of the *Evening Post*. He was one of the original editors of *Putnam's Magazine*, and edited *The Harbinger*, organ of the Brooke Farm community. His published works include: *A Popular View of the Doctrines of Charles Fourier* (1844); *Handbook of Universal Biography* (1851); *Political Essays* (1856); *Cyclopædia of Biography* (1863); *Out of the Past* (2 vols., 1870); *Life and Writings of William Cullen Bryant* (16 vols., 1883-4); *A New Study of the Sonnets of Shakespeare* (1900).

**Godwin, William** (1756-1836), English author, was born at Wisbeach in Cambridgeshire. From 1783 till his death he led the life of a man of letters; and he made the acquaintance of Thomas Paine, Horne, Tooke, Mackintosh, Wordsworth, Southey, Coleridge, Lamb, and Shelley. He formed a connection with Mary Wollstonecraft; both ostentatiously denied the importance of legal ties, except in the interests of issue; and the child of this union, at whose birth the mother died, formed in 1812 a similar union with Shelley, which was likewise afterward legitimated. His best known works are: *An Inquiry Concerning Political Justice* (1793), containing the most radical of the French theories on morals and government, and *The Adventures of Caleb Williams* (1794); but perhaps his most useful productions are the *History of the Commonwealth of England* (1824-8), and his charming *Fables* (1805) and other children's books published under the name of 'Baldwin.'

**Godwin-Austen, Dapsang, or K<sub>2</sub> peak**, 28,265 ft., Mustagh Range, Western Himalayas, North Kashmir, India, is one of the three highest peaks in the world.

**Godwin-Austen, Henry Haversham** (1834-1923), English military surveyor. He rendered great service to science by his works

*On the Land and Fresh Water Mollusca of India* (1882-99), *The Fauna of British India* (1908), and by his surveys in Kashmir, Ladakh, and Bhutan. His name has been given to Mount Godwin-Austen.

**Godwit**, a genus of birds of the snipe family, with very long bill, slightly curved upward, and long slender legs, with a great part of the tibia bare. All the species frequent marshes and shallow waters, chiefly those of the sea coast, where they seek their food like snipes by wading and by plunging the long bill into the water or mud. Like many of their allies, they are valued as food. Two cinnamon-tinged species, the Black-Tailed Hudsonian and the Marbled Godwit, visit the coastal and inland waters of the United States in winter, and the latter breeds throughout the northern interior of the country.

**Goebbels, Dr. Paul Joseph** (1897- ), editor, was born at Rheydt in the Rhineland. His degree of Ph.D. was received at Heidelberg when he was 24 years old. In 1926 he was called by Hitler to 'convert' Berlin to nazism. Two years later he was elected to the Reichstag and in 1929 he entered the city Council of Berlin. He has written widely attacking communism, and he has been in the forefront in assailing the Jews. At the age of 35 he was made chief of the ministry of propaganda.

**Goering, Hermann Wilhelm** (1893- ), Ger. Nazi public official, was commissioned an infantry lieutenant at start of World War, later transferring to the airforce. He was shot down wounded by a British airman in 1917. Went to Sweden at close of war and served as pilot for Swedish Commercial Airways. Returned to Bavaria in 1920 determined to overthrow the republic. He first met Hitler in 1921 and was appointed to organize the brown-shirted Nazi forces. When Hitler attempted his Munich coup d'état in 1923, Goering marched beside him and was wounded when the rebellion was broken by the army. When Hitler became dictator Goering was put in charge of the airforce which grew to be the most potent in the world. He also secretly organized the German army and the secret police. In 1936 he was appointed Commissioner for the Four-Year Plan, in complete charge of organizing the country, physically, economically, and mentally, for war. In 1939 Hitler named Goering as his successor.

**Goethals, George Washington** (1858-1928), American soldier and engineer, was

born in Brooklyn, N. Y. His early engineering practice included the construction of the dams, canals, and locks at Muscle Shoals, in the Tennessee River, and the building of the fortification and harbor works at Newport, R. I. In 1907 Colonel Goethals was chosen chairman and chief engineer of the Panama Canal Commission. Under his administration the work was entirely reorganized; an efficient system of sanitation was established, with the aid of Gen. Gorgas; and one of the greatest engineering projects of modern times was brought to completion. In February, 1914, Goethals was appointed first civil governor of the Canal Zone, and in 1915, by special act of Congress, he was promoted to the rank of major general in recognition of his services in the construction of the Canal. After serving in other administrative capacities, he retired from active service at his own request in 1919, and established a practice as a consulting engineer. He was the recipient of many honors, decorations and badges.

**Goethe, Johann Wolfgang von** (1749-1832), German poet, dramatist, and philosopher, was born in Frankfurt-on-Main. From his mother came the elements of his poetic genius; from his father the stability of character which carried him through the vicissitudes of a life strongly influenced by powerful and at times almost overwhelming imagination. As a boy he was quick to learn, and had the advantage of careful instruction from his father and from tutors. The former wished him to take up law, but Goethe wrote lyrics and plays while a law student at Leipzig. In 1770 he went to the University of Strassburg to resume his legal studies. Here he met Herder, who inspired him with his own enthusiasm for Shakespeare and for popular poetry.

The drama *Götz von Berlichingen*, was published in 1773. The summer of 1772 he spent at Wetzlar, the seat of the imperial law courts; his hopeless love for Charlotte Buff, whom he met there, supplied some of the materials for *Die Leiden des Jungen Werther* (1774), a novel, which owes much to Rousseau's *Nouvelle Héloïse* and something to Richardson's novels. It quickly made him famous, even beyond Germany. The emotional and sensitive Werther, a victim of his environment was the typical young man of the 'Storm-and-Stress' period. In addition to these works Goethe had begun his *Faust*, destined to occupy his thoughts more or less throughout his life, and had written the plays *Clavigo* (1774), and *Stella* (1775), and some

notable lyrics, the best being addressed to Elisabeth (Lili) Schönmann, to whom he was engaged for a short time.

A momentous turning point in Goethe's career was the invitation to Weimar in 1775: he was at first the guest of Duke Karl August, but soon received one appointment after another. Between 1775 and 1786 he wrote some lyrics, in part inspired by his friend Charlotte von Stein; several longer poems; several short plays; and the early drafts of *Iphigenie*, *Tasso* and *Egmont*. *Faust* was carried further, and *Wilhelm Meister* was begun. Goethe went to Italy in 1786; the incidents of his stay there he has told in his *Italianische Reise* (1817). At Rome he devoted himself to the study and practice of art. He now finally subdued all tendencies to excess in life and art, and attained the Greek ideal of the golden mean of reposeful harmony. In this spirit he gave to *Iphigenie* its final form (1787); he also completed the drama *Egmont* (1788).

On his return to Weimar in 1788, he surrendered almost all the offices he had held. In 1789 the final version of the drama *Tasso* was completed. Goethe himself described his hero as an intensified Werther, and insisted—with good reason—that much of his own life and feelings had passed into the play. In his own heart there had been long struggle between the high-strung sensibilities of the poet (Tasso) and the conscientious obedience to the claims of a public life (Antonio). In 1790 appeared *Faust, ein Fragment*. He had put together such scenes as were completed, and did not intend to carry out the whole; it was Schiller who urged him to take it up again. The first part was issued in 1808, the second part did not appear until 1833. Goethe showed the interest aroused by the French Revolution in several plays of slight intrinsic importance. In 1793 he gave much time to scientific studies, in the course of which he made some important discoveries in comparative anatomy and vegetable physiology, and combated Newton's theories in optics. His studies in science failed to impress contemporary scientists, however, perhaps because of his advanced viewpoint.

In 1794 he first came to have more than a superficial acquaintance with Schiller, whom he had been instrumental in appointing professor of history at Jena in 1789. Schiller invited him to contribute to *Die Horen*, a literary journal he proposed to issue; and the letter in which he did so starts the noteworthy correspondence between Germany's two greatest poets, who for the next ten

years (till Schiller's death) were united by the ties of closest friendship, and stimulated and criticised each other in the most fruitful way. In 1796 Goethe and Schiller between them wrote some six hundred *Xenin*, pithy sayings, in which they expressed their smiling contempt for many of the literary and philosophic tendencies of the time. Goethe also wrote *Alexis und Dora*, perhaps the most perfect expression he ever gave to the Greek



Goethe

spirit. In 1797 he produced *Hermann und Dorothea*, perhaps the finest and most perfect work of art he produced. It is an epic poem in nine cantos, in hexameter verse. Its success recalled that of his *Werther*.

In 1798 Goethe began to edit *Die Propyläen*, a magazine mainly devoted to the arts; he wrote the beautiful elegy *Euphrosyne*, on the death of the young actress Christiane Becker. In 1805 he composed his interesting work on *Winckelmann und sein Jahrhundert*. The death of Schiller in this year was a terrible blow to Goethe who was devotedly attached to him. Goethe has set up a noble monument to his friend in his beautiful and inspiring *Epilog zu Schillers Glocke*. Of his later works the following—besides those already mentioned—are the most important: *Farbenlehre* (1808-10), containing his views on optics, which to his great disappointment did not commend themselves to contem-

ary scientists; *Wahlverwandtschaften* (1809) is 'a psychological, even a pathological novel,' remarkable for its skillful composition; and *West-Oestlicher Divan* (1819), a collection of lyrics modelled on the *Divan* of Hafiz, and combining Oriental imagery and rhythm with German feeling. In 1824 Goethe edited the letters which had passed between himself and Schiller.

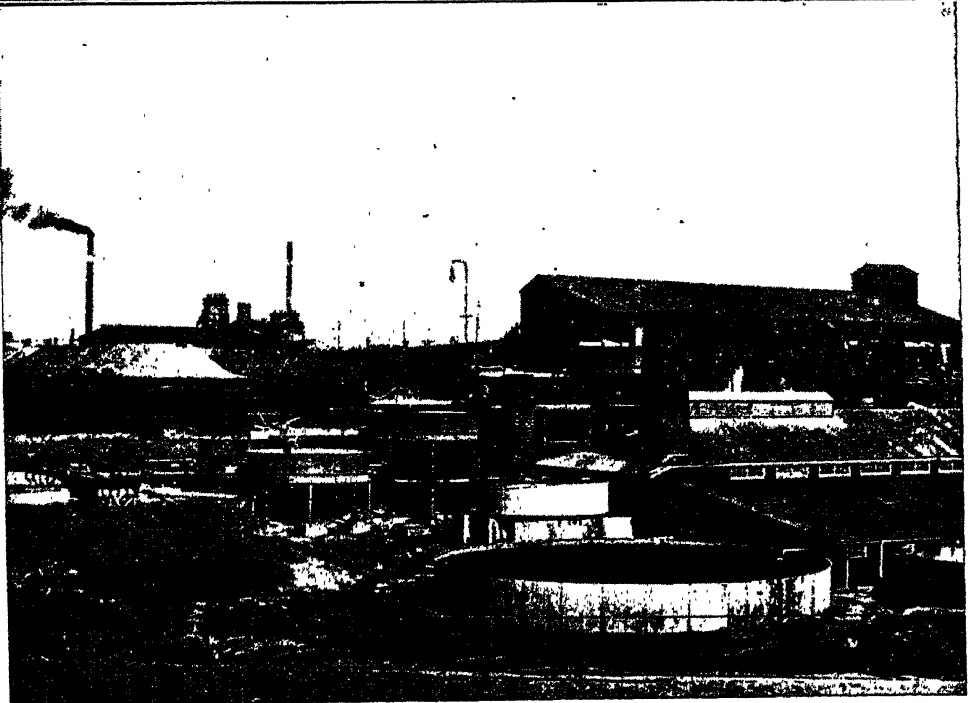
**Goetschius, Percy** (1853- ), American composer, teacher, and author, was born in Paterson, N. J. He studied music in the Stuttgart Conservatory, and in 1892 he went to Boston as professor of composition in the New England Conservatory. From 1905 to 1925 he was professor of theory and composition in the Institute of Musical Art, New York City. His publications include *The Material Used in Musical Composition* (1882); *Exercises in Melody Writing* (1900); *Applied Counterpoint* (1902); *Larger Forms of Musical Composition* (1915); much church music and many contributions to musical journals.

**Goffe, William** (?1605-79), English regicide son of a rector of Stanmer, as one of the judges, signed the death warrant of Charles I. Not being included in the Act of Indemnity, he escaped to America, where he settled in 1664 in Hadley, Mass., where he is said to have rallied the inhabitants during an attack by the Indians in 1675, and to have beaten back the savages. Mention of this is made in Scott's *Peveril of the Peak*, in Cooper's *Wept of Wishton-Wish*, and it is also the subject of Hawthorne's *The Gray Champion* in his *Twice-Told Tales*.

**Gog and Magog**, names occurring several times in the Scriptures, referring apparently to some northern people or region. Magog is referred to in Genesis as a son of Japheth; Ezekiel speaks of Gog, prince of Magog; Gog and Magog are mentioned also in Revelation. The names are also given to the two huge wooden statues in the Guildhall, London.

**Gogh, Vincent van** (1853-90), Dutch painter, started as an art dealer, but later turned to theology and became an evangelist. Returning to art he studied at Antwerp Academy, in 1882; typical of this period are *The Potato Eaters*, *Winter*. In 1886 he came in contact with the impressionists and produced a number of still lifes, landscapes, portraits and figure studies, all in his barbaric treatment and bright coloring, among them *The Bridge at Arles* and *Sunflowers*.

**Gogol, Nikolai Vasilievitch** (1809-52), Russian author, was born in Sorochintsi in



*Gold Mining and Extraction.*

Upper, As it was done in 1849 in California. Lower, Surface equipment of gold mine in South Africa. Copyright, Ewing Galloway, N. Y.

Poltava. He served a short term as a government clerk, during which time he produced his first famous work, *Evenings at a Farm near Dikanka* (1831-4). After lecturing for two years at St. Petersburg he lived abroad, chiefly in Rome (1836-46) and in 1846 returned to Russia, and died in Moscow. His best known works are *Mirgorod* (1834); *Old-World Gentle-folks*; the *Government Inspector*; and his greatest work *Mertvuiya Dushi* (Eng. trans., *Dead Souls*, 1886), a part of which appeared in 1842, the second part being burned by him unpublished just before his death. A complete edition of his works was published at Moscow (1856-7).

**Gogra**, or **Ghagra**, chief river of Oudh, India, rises in the Himalayas, and finally joins the Ganges just above Chapra.

**Goil, Loch**, arm of the sea branching off Loch Long, Argyllshire, Scotland. The mountains of Argyll's Bowling Green rise abruptly from its eastern shores, while Ben Bheula (2,557 ft.) and several small heights flank the western side.

**Goiter** (Fr.), or **Bronchocele**, sometimes called 'Derbyshire neck,' is a simple (*i.e.* non-malignant), chronic enlargement of the thyroid gland. The enlargement may cause only a slight swelling of the neck, or it may amount to a pendulous growth weighing several pounds. It is now known to be a deficiency disease resulting from an inadequate supply of iodine in water and food. In the United States it is most common in the region of the Great Lakes and the northern Pacific Coast. In these regions the iodine-content of the drinking water is low. There are, however, other factors less evident now being investigated in the field of gland study. Systematic measures of control were first begun in 1917 when iodine was used in the prevention of goitre in the school population of Akron, Ohio.

Exophthalmic Goitre, thyrotoxicosis, also known as 'Graves's Disease,' or 'Basedow's Disease.' The three special symptoms of exophthalmic goitre are: (1) swelling of the thyroid gland, (2) irregularity of the heart's action (palpitation and tachycardia), and (3) protrusion of the eyeballs, though there is no regularity in the order of development of these symptoms, and possibly not over half the cases show exophthalmos. It is far more common among women than among men, and develops usually before the age of thirty. Its causes are imperfectly known. Death may result, either from heart-failure

or from pressure of the enlarged thyroid upon important structures.

**Gok-Cha**, or **Sevangy**, lake, Armenia, in the government of Erivan, situated about 6,340 ft. above sea-level. On an island in the northern part of the lake stands the ancient Sevanga monastery.

**Golconda**, a ruined city in the Nizam's dominions, India, 7 miles w. of Haidarabad. It was once the capital of the kingdom of Golconda and the diamonds for which it was once famous were found in the southern part of the Nizam's territory, and were cut and polished here.

**Gold** (Au. 197.2), a metallic element prized from the earliest times on account of its being found free, and because of its unalterability which renders it valuable for coinage, jewelry, and ornamental purposes. It is widely distributed in nature, being found in all parts of the globe, occurring principally in rock formations or in alluvial deposits. The latter are known as 'placers.' In placers the gold is free, and almost pure or slightly alloyed with silver, and is present in rounded particles, varying in size from minute grains to considerable nuggets, mixed with much gravel, sand, or clay, having been removed from its original location by the action of water. In the United States the Californian placer deposits were the cause of the 'rush' of 1849; but of these the shallow, rich, and easily-worked ones are exhausted, and the poorer and more inaccessible placers are now being operated. Beginning in 1897 the placer deposits of the Yukon (of which the Klondike is a tributary) in Alaska and Canada have also attracted great attention. In Australia the gold 'diggings' of Victoria and South Australia, famous from 1851 onwards, were shallow placers, and were marked by the existence in them of nuggets of considerable weight. Thus, South Australia produced the 'Blanche Barkley' nugget weighing 146 lbs., and Victoria, the 'Welcome' nugget weighing 183 lbs., and worth more than \$40,000. In Europe the only important alluvial deposits are in the Urals, while those of Siberia are the chief in Asia. In Africa those of the Gold Coast and Abyssinia were formerly important.

Besides the sources of gold mentioned above, gold telluride is found in America and Australia, and sea-water contains minute quantities, usually less than one grain of gold to the ton. Shallow placers, in which the material is on or near the surface, require only



1. Chamois.  
2. Moufflon.

# WILD SHEEP AND GOATS

3. Argali.  
4. Markhor

a shallow pit to be sunk, the 'dirt' being washed to remove sand and mud—the gold, because of its high specific gravity, remaining behind. Washing may be carried out on a small scale in a simple sheet-iron pan, or, better, in a rocker or cradle. The working of these placer deposits, requiring simply the washing of the 'pay dirt,' can be carried out by individuals or small parties with very little capital, thus rendering the conditions obtaining in the Californian, Australian, and Yukon 'rushes.' Deep placers may be worked by the ordinary methods of mining. In the case of deposits in the beds of rivers, the auriferous gravel is collected either by diversion of the stream, or more usually by dredging.

Auriferous rock deposits may be divided into four classes: (1) metalliferous veins containing gold in company with metallic sulphides, principally iron pyrites; (2) quartz reefs containing gold, principally free, but also in sulphides, disseminated in the quartz; (3) the 'blanket' reef of the Witwatersrand or 'Rand,' which consists of a conglomerate of quartz pebbles cemented together by silica and iron oxide, the gold being present in a very fine state of division, chiefly in the cement; and (4) siliceous deposits containing gold. In working such deposits, the mined rock containing the gold is first broken by some kind of stone crusher into small pieces, and then reduced to the finest power by stamps. Water is run through, and the gold collected on amalgamated copper plates, which are placed in front of the mortar.

The material that escapes from the plates contains some gold, and is now 'concentrated' to remove worthless sand and the like, as far as possible. The concentrates, if non-pyritic, are treated in grinding pans in the bottom of which mercury is placed. The amalgam is heated in an iron retort to distil off the rest and leave the gold, which is then melted and cast into bars of gold bullion of varying fineness. The combined equipment for accomplishing this work is known as a stamp mill. While simple stamping and amalgamation with mercury do fairly well for weathered and 'free-milling' ores containing free gold in a suitable form for solution in mercury, those ores of a more refractory character, and containing gold together with sulphides, require to be 'dead' roasted (all of the sulphur oxidized and removed) before being amalgamated, or to be submitted to a chemical treatment to obtain the gold.

Impure gold is melted in crucibles, and the

impurities fluxed off with sodium carbonate and a little nitre. If much base metal is present, the gold is refined by nitre and borax, added a little at a time, and the slag skimmed off at intervals. Gold has a yellow color when in mass, but in a finely divided state it may be purple, ruby, or black. It is very heavy (sp. gr. 19.3), the most malleable and ductile of metals and also one of the softest. These last properties render possible the preparation of gold leaf. Gold melts at  $1,063^{\circ}\text{C.}$ , and is volatile at very high temperatures, such as that of the electric arc. It is a good conductor of heat and electricity, and is unaffected by air and most reagents.

Gold is extensively used for coinage, being alloyed with ten per cent. of copper or silver to harden it against the wear and tear of circulation. Gold alloys are also largely employed for jewelry, the gold content of these alloys being expressed in carats or parts of pure gold in twenty-four. Thus 18-carat gold is composed of 18 parts of pure gold alloyed with 6 parts of copper and silver in such proportions as are required to produce the desired color. See ALLOYS; ASSAYING; BIMETALLISM; COINAGE; CURRENCY; METALLURGY; MINING. A report issued by the U. S. Bureau of Mines, May 2, 1933, gave an interesting calculation of the total production of gold since its mining became definitely recorded. From 1493 through 1931, the world total was set at 1,085,000,000 ounces. United States production, beginning in 1792, had totaled to then (1931) 226,384,295 ounces, worth \$4,679,778,700. The world production of gold steadily decreased in quantity after 1915 until 1922 and since then it has been gradually increasing, the 1940 production exceeding that of any previous year. The opening of new gold fields and improved methods of extraction from low grade and refractory ores, notably by the cyanide process, was mainly responsible for the increase. Since the present depression, the high value of gold and the premium upon it, added to low costs of mining, labor and equipment, has led to a gold boom and the reopening of many abandoned mines. World gold production for the year 1938 is estimated at 31,865,000 ounces against 29,767,000 ounces in 1937, Russian production not included. The United States produced 5,611,000 ounces in 1939. Other leading gold mining countries are South Africa, Russia, Canada, Australia and Japan.

*Gold Standard.*—A striking increase in the world's monetary stocks of gold resulted from the increased gold production since 1922.

During the 'depression' years these stocks have been augmented by release of large sums of hoarded gold from India and from China. The fact that despite this the gold standard was abandoned during 1931-33 by all but five of the most progressive nations of the world, indicated the existence of serious problems in connection with the system. This raises the question, 'What is the Gold Standard, and when is it actually in force?' Two points are essential for its full and complete operation: (1) The convertibility of gold and gold bullion must be free and unlimited; (2) money of all kinds must be directly or indirectly exchangeable for gold coin.

The purchasing power of the unit of money must be the same as that of a fixed and invariable amount of gold of a given fineness. The gold unit must be legal tender in all domestic transactions, and the parity of all collateral or subsidiary money with it must be maintained. There must be no restriction upon the right of private owners of gold to melt down coin into bullion, to bring bullion to the mint for free coinage in any amount, or to import or export gold. These are the conditions essential to what is known as a gold coin standard, gold or its equivalent certificates being used in actual circulation. The United States, until its abandonment of the gold standard in 1933, was the outstanding example of the system. At the end of January, 1933, there were \$478,744,343 in gold coins in circulation, besides \$591,320,079 in gold certificates.

After the World War, many countries withdrew gold from circulation to economize the supply. There are variations of the gold standard under which gold does not appear as currency. Under the gold bar standard it is retained as cover for the money in actual circulation, which must be redeemable in gold bullion. Collateral or subsidiary money must be kept at parity with gold bullion in purchasing power, and standard money must be issued to any depositor of gold bullion. The free export or import of gold bullion must not be subject to legal interference. Gold may thus be concentrated in central bank reserves, and the government may establish large minimum amounts for the conversion of currency into bullion. This system makes private hoarding unprofitable and does away with the necessity for minting gold.

Another variation is the gold exchange standard, under which currency is convertible not only into gold, but into exchange

of another gold standard country. Foreign as well as domestic reserves thus serve as cover for domestic currency. This system was adopted after the war by many countries, but has serious disadvantages. The same amount of gold is obliged to operate at the same time in two markets. Short-term capital, which may be moved from one bank to another for the sake of interest rates, tends to accumulate, and its sudden or arbitrary withdrawal may seriously embarrass the country from whose reserves it is drawn. The gold standard is a comparatively modern institution. The World War led to its general abandonment. The belligerent nations were unable to continue convertibility, in view of the immense sums which had to be borrowed to finance the war. Their imports, moreover, were largely to be covered by gold. The United States, Switzerland, Holland and Sweden continued to use gold, but placed embargo on its export.

After the war a period of inflation set in which reached fabulous extremes, especially in Germany, Austria and Russia. The adoption of the Dawes Plan in 1924 marked the beginning of reconstruction, and there was a general movement to return to the gold standard. Great Britain was the only country to stabilize at the pre-war par. France stabilized the franc at 1-5 of its former value. Germany, where inflation had reached such fantastic heights as to wipe out all inter-debts, started afresh with a new unit of value, the Rentenmark, in place of the former mark. The world-wide depression led to a general abandonment of the gold standard. Its temporary restoration was made possible for the debtor countries through long-term loans extended by creditor countries, especially by Great Britain and the United States. These loans largely ceased after 1930 and pressure on the debtor countries soon resulted in a crisis. In May, 1931, the large bank of Austria, the Kreditanstalt, became insolvent. In June, large withdrawals of gold from Germany occurred. President Hoover planned for delay in payment of the war debt, eased the situation, but only temporarily. The force of the crisis was soon felt in England. Freezing of short-term credits from Germany and Austria, and withdrawals from other countries, led to serious depletion of the gold reserves, despite large credits granted by the Bank of France and the Federal Reserve System of the United States. During July and September, \$1,000,000,000 had been withdrawn from London, and in September, 1931,



it was necessary to suspend the Gold Standard Act. England's example was followed by 14 countries in 1931 and seven in 1932.

Large withdrawals of gold from the United States followed England's suspension of the gold standard. Earlier in the year there had been an inflow of gold, chiefly from South America, the Orient and Canada. After the middle of September there was an outflow of gold from the United States to Europe, especially to France. Due to excessive demands for gold at home and abroad, the United States abandoned the gold standard in April, 1933, and by September the only nations holding to gold were those of the so-called 'gold bloc'—France, Belgium, Netherlands and Switzerland—with the addition of Germany.

An immediate return to the gold standard was held by many economists to be imperative. The Gold Bloc hoped for some international agreement on these lines. They claimed that sound money was unthinkable unless linked to a fixed and internationally recognized standard, and that the gold standard was at least semi-automatic and less open than others to political pressure. Alternatives to a gold standard may be found in some form of managed currency. Leaders of the group advocating a system unconnected with gold were John M. Keynes and Sir Basil Blackett in England, Dr. Gustav Cassel in Sweden, and the Committee for the Nation in the United States. Their view held that money should be so stabilized that it would always buy the same amount of goods, and that the domestic price level should not be at the mercy of fluctuations in the value of gold, which was far from automatic and according to Keynes, was itself a 'managed currency,' being subject to control by central banks. Since each nation would have its own form of 'managed' currency, international plans would be difficult to secure. See CURRENCY.

A system of managed currency had already been in operation in England for over a year through the Exchange Equalization Account. This was an anti-deflationary measure, designed to stabilize the domestic price level by eliminating the effects of short-time fluctuation in the value of the pound. The Account went into effect with the Finance Act on July 1, 1932, and by Act of Parliament was provided with funds up to £150,000,000, the Treasury being empowered to borrow on notes to raise this amount. In May, 1933, the House of Commons voted to increase the fund to £350,000,000, the increase to become

effective with the new Finance Act in July

In asking for the fund in 1932, Chancellor of the Exchequer Neville Chamberlain explained that it was designed to deal with unwanted inflows or overflows of capital. When the pound rose, the Exchange Equalization Account would sell pounds and buy gold or foreign currencies. The new tariff law had served to correct the adverse balance of trade; and the balancing of the Budget as protection against a fall. The pound, therefore, could be kept at a comparatively even level.

Though it did not affect longtime trends in the balance of foreign exchange, the Account acted as a safeguard against short-term fluctuations due to speculation, sharp variations in foreign exchange, or sudden withdrawals of foreign capital like those which in 1931 drove England off the gold standard. It served as ballast when the pound showed signs of rising and as a reserve to prevent it from being forced down.

Despite official abandonment of the gold standard, Great Britain continued to buy gold, and on April 29, 1933, the Bank of England held £185,938,526, worth at the current value of the pound £250,000,000, a larger surplus than at any time in her previous history. In addition to the amount required to stabilize the pound, a reserve was necessary for the occasional payment of foreign debts and as cover for Bank of England notes. The gold basis of the currency was maintained, though the legal obligation to pay out gold in exchange for notes had been suspended.

In 1932, after the Budget had been balanced and a new tariff enacted, confidence abroad was restored and foreign capital began to return to England. This caused the pound to rise, and to meet the situation the foreign exchange restrictions of 1931 were withdrawn and the Bank of England bought largely of gold and foreign exchange. Abandonment of the gold standard by the United States caused another rise in the pound, to check which the new increase in the fund was decided upon.

During the period of emerging from the depression, it may be that national currencies, more or less divorced from the currencies of other nations, were more conducive to the prosperity of any individual country than a general linking together of nations under a gold standard. This assumes that the distribution of gold was a major cause of the depression difficulties. Dr. Richard T. Ely

considered it a secondary factor. It was true that, owing to American tariffs and French currency devaluation, gold flowed toward New York and Paris, precipitating competitive rises in bank rates in the rest of the world. But the underlying causes were rooted in economic nationalism, tariff barriers, and war and post-war debts. In advocating an early return to the gold standard, the Gold Delegation of the League of Nations in its 1932 report recommended the avoidance of fluctuations through international coöperation among central banks, to be coördinated with the internal policies of the countries concerned. They also recommended settlement of the war debt problem and the restoration of reasonably free movements of goods and services.

Among the members of this Gold Delegation were some of the world's most famous economists, yet after studying the career of the gold standard as it ran for years before and after the breakdown, they were unable to settle upon either the causes or the remedies. They agreed, however, in their report that:

'The working of an international monetary system such as the gold standard presupposes the interdependence of nations. If, however, political conditions are such that nations hesitate to commit themselves to too great interdependence one upon the other, but impose rigid restrictions upon international trade in their effort to attain economic self-sufficiency, there will be little scope for any international monetary mechanism. . . . Without some measure of political settlement leading to renewed confidence in international economic and financial relations, there can be no secure basis for the restoration and improvements of world trade and finance.'

The World Monetary and Economic Conference met at London June 12, 1933 and recessed for an indefinite period on July 27. No agreement on the most important issues proved possible, because of developments in the United States.

The exigencies of the economic and political situation were making it increasingly hard for President Roosevelt and his 'New Deal' Administration to carry through international policies and at the same time follow the comprehensive program at home which was planned to raise prices, increase employment, and stimulate business along nationalistic lines. Stabilization with gold would have prevented the price-rise program and technical difficulties made it difficult to stabilize inter-

national currency with gold backing removed. The conference was urged by the American and other non-gold delegations to discuss other matters, such as tariffs. The 'Gold Bloc', however, persisted in advocating active measures to ensure some form of gold standard. The only concrete result was a silver price plan for silver-consuming nations.

In 1939 the gold reserves of 52 countries totalled \$25,702,000,000, of which the United States held \$17,644,000,000. The world's greatest storage of gold being in the U. S. Government's specially constructed gold vault at Fort Knox, Ky. Consult T. C. Earl's *Gold Dredging* (1913); T. K. Rose's *The Metallurgy of Gold*; F. A. Thomson's *Stamp Milling and Cyaniding* (1916); J. C. Johnson's *Getting Gold*, a Practical Treatise for Prospectors (1917); Wilson's *Hydraulic and Placer Mining* (1918); Gowland's *Metallurgy of the Non-Ferrous Metals* (1921); Austin's *Metallurgy of the Common Metals* (1926); Liddell's *Handbook of Non - Ferrous Metallurgy* (1926).

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**Gold Coast**, British colony on the w. coast of Africa, stretching about 350 m. along the coast of the Gulf of Guinea, between the French colony of the Ivory Coast and the former German colony of Togoland. Inland it extends to about 11° N. lat., and comprises the former kingdom of Ashanti (definitely annexed in 1901), and what are known as the Northern Territories. Capital, Accra. The soil is fertile, especially near the coast, and produces coffee, tobacco, cotton, and other tropical produce. Forests grow in the w., and gold is plentiful in the districts of Wassa and Tarkwa, also in the w. The principal exports are palm oil, copra, rubber, palm kernels, lumber, cocoa, kola nuts, and gold dust. The climate is hot and unhealthy, and the rainfall heavy. There are several Government schools and many other schools un-

der the control of various missions; p. 2,869,-854. Although the English first settled in this region in 1640, British power was not definitely consolidated on the Gold Coast till 1870-72.

**Golden**, city, Colorado, county seat of Jefferson co. It is the seat of the Colorado School of Mines (1874) and the State Industrial School for Boys; it is known for truck farming, fruit growing, coal and copper mining, smelting, brick, tile and flour manufacture. Among objects of historic and scenic interest are the former state capitol building, the city park, Castle Rock, and Mount Lookout, which commands magnificent views, and is one of the finest mountain resorts in the state. Golden was settled in 1859; p. 3,175.

**Golden Age**, an epoch of primitive innocence and prosperity; hence the best age of any country's history, literature, or art. Thus the golden age of Italy was in the early 16th century, or 'Cinque Cento'; that of France the period of Louis xiv., and of England the reign of Elizabeth.

**Golden Bull**, a document drawn up by the Emperor Charles iv. in 1356 to settle matters connected with the imperial election. It remained a fundamental law until the close of the Holy Roman empire in 1806. By it the number of the electors was fixed at seven, the election of the future emperor was to take place at Frankfort-on-Main, and the elected prince was to be crowned at Aachen (Aix-la-Chapelle), and to hold his first Diet at Nuremberg.

**Golden-crested Wren**, or **Kinglet** (*Regulus cristatus*), is one of the warblers (Sylviidae). The length of the body is from three to six inches, there is a bright yellow crest, the back is yellowish olive green, the wings and tail ash brown with black and white markings. It is seen in the United States only in winter.

**Golden-eye** (*Clangula americana*), a duck which visits the United States in winter, but breeds only in Canada.

**Golden-eye Fly**, or **Lacewing Fly** (*Chrysopa vulgaris*), an insect belonging to the Neuroptera, remarkable for the golden sheen of the eyes and the delicate greenish color of the body.

**Golden Gate**, the strait, 5 m. long and from 1 to 2 m. wide, leading from the Pacific into San Francisco Bay, California.

**Golden Legend**, a collection of lives of the saints, composed by Jacobus de Voragine

(1230-98). It contains many well-known mediæval tales.

**Golden-rod**. Any member of the large composite genus *Solidago*, which is chiefly North American. The tiny heads have one series of white or yellow ray-flowers, and are gathered into various forms of inflorescence, often of a massive character; they appear in late summer and autumn. The golden-rods are conspicuous for their bright color, especially as they are apt to grow in huge colonies in fields and along roadsides. The giants of the group are *S. canadensis*, a common golden-rod in fields, topped by a large panicle of slender drooping branches on which the flowers are secund; the rough, variable *S. rugosa*, with large terminal pyramidal panicles, composed of bright-golden flowers on the upper sides of the slender, recurving branches, which spread widely; and the salt-marsh golden-rod (*S. sempervirens*).

**Golden Rose** (*Rosa aurea*), an ornament of wrought gold, solemnly blessed by the Pope on the fourth Sunday in Lent (Lætare Sunday), and sent as a mark of special favor to some sovereign, church, or community.

**Goldfinch** (*Carduelis elegans*), a pretty little bird which occurs throughout England. It is a favorite cage-bird, both on account of its bright plumage and its power of song. The American bird is a related finch, the black-winged yellow-bird or thistle-bird (*Astragalinus tristis*), the male of which appears in summer bright yellow with black wings, tail and cap, while the female is dull olive-brown, both sexes assuming the latter plumage in winter, for the species is not migratory. They flit about the fields and roadsides in small bands, flying with a characteristic undulating motion and uttering a sweet warble.

**Gold-fish** (*Carassius auratus*), a member of the carp family which occurs abundantly in the wild state in China and parts of Japan. The wild form is of a brownish color, but the domesticated race has the familiar red-gold tint. Gold-fish have been kept and bred in confinement in Japan for a prolonged period, and many remarkable varieties and monstrosities have been produced by selective breeding. They are stated to have been introduced into England in 1691.

**Gold Lace**, properly speaking, does not signify actual lace, but braid or cord made of gold-covered silken threads, which on naval and military uniforms serves to indicate rank and different branches of the service.

**Gold Leaf**, one of the forms in which gold is applied for the purpose of gilding, is prepared by a prolonged beating out of the metal between sheets of vellum and thick skin. A preliminary fusion at a high temperature serves to increase the malleability of the gold; after which it is cast into ingots, and rolled between powerful smooth steel rollers to a ribbon about 10 ft. long and one and a half inches wide. After annealing, this is cut into pieces weighing about six and a half grains, which are then ready for the beating-out process. First the pile of alternate paper, gold, and vellum is beaten for about twenty minutes with a hammer weighing some eighteen or nineteen pounds. The gold leaves are then removed, cut into four pieces with a steel knife, and alternated with the skins of the 'shoder.' These latter are prepared from the outer coating of the 'cæcum' or blind-gut of cattle. In the shoder some two hours' beating with a 10-pound hammer is requisite; after which the leaves are again cut into four pieces and placed in the 'mould' in which only the finest skins are used. The leaves are about three and a quarter inches square, and are produced in ten different shades of color, according as the gold was alloyed with much or little copper or silver.

**Goldman, Emma** (1871-1940), anarchist, was born in Kovno, Russia, and emigrated to America in her girlhood, settling at Rochester, N. Y. She attracted public attention when her friend Alexander Berkman was arrested for shooting Henry Clay Frick. In 1917 she was convicted of conspiracy against the draft act for exhorting young men not to join the colors. After a two-year prison term she was deported to Soviet Russia where communism was no more to her liking than capitalism had been. She and Berkman left Russia for France, where they made their home in Nice. In 1935, she was allowed to visit the U. S. on a lecture tour. Her autobiography had a wide sale in America.

**Goldmark, Karl** (1830-1915), Austrian composer, was born at Keszthely, Hungary, son of a poor Jew, was brought forward by Hellmesberger, director of the Conservatorium at Vienna. *The Queen of Sheba* (*Die Königin von Saba*), a work teeming with gorgeous Oriental color, first bespoke his greatness. This was produced at the Court Opera in Vienna in 1875. But Goldmark will perhaps be best remembered by his so-called symphony, *The Country Wedding* (*Ländliche Hochzeit*), a descriptive orchestration played all over Europe.

**Gold of Pleasure.** An inconspicuous, European cruciferous herb.

**Goldoni, Carlo** (1707-93), Italian writer of comedy, born at Venice. His first tragedy, *Amalasunta*, failed; but he achieved success with *Belisario* (1734). He ultimately found his true vocation in comedies. A selection of his works appeared in English as *The Comedies of Goldoni* (1892).

**Golds,** a primitive people belonging linguistically to the Tungusic group, and inhabiting the banks of the Lower Amur and the Usuri, Southeastern Siberia.

**Goldsboro**, city, North Carolina, county seat of Wayne co. Manufactures include cotton, lumber, and veneer. The raising of corn, rice, tobacco, vegetables, cotton and strawberries are important industries; p. 17,274.

**Goldsborough, Louis Malesherbes** (1805-77), American naval officer. He was a member of the Army and Navy Commission in California and Oregon, was superintendent of the U. S. Naval Academy in 1853-7, was promoted to captain in 1855, and to rear admiral in 1862. During the Civil War he served with the blockading squadron, and took part in the North Carolina expedition in 1862.

**Goldschmidt, Meyer Aaron** (1819-87), Danish publicist and author, was born in Vordingborg, of Jewish extraction. He early engaged in journalism and became famous and feared as editor of the Copenhagen comic paper *Corsaren* (1840-6). He published his first romance, *En Jøde* (Eng. trans., *The Jew of Denmark*) in 1845 and followed this in 1846 by *Fortællinger*. In 1847 he founded the magazine *Nord og Syd* (1847-59), which, edited and written entirely by himself, became renowned for masterly treatment of social and political topics.

**Goldsmith, Oliver** (1728-74), British author, was born in Pallas, county Longford, Ireland. Entering Trinity College, Dublin, as a 'sizar,' or poor scholar (1744) he eventually went as a medical student to Edinburgh (1752). Thence proceeding to Leyden, he lost his last shilling at play, and started on foot for 'the grand tour' relying mainly for support upon his flute. Making his way to London (1756), he was in turn a strolling player, proof reader for Richardson, a hack worker for John Newberry the bookseller, usher at Dr. Milner's 'academy', a chemist's assistant, and at last an author of all work for Griffiths' *Monthly Review*. Becoming known to Johnson, he formed one of the lexicographer's circle. Noll's quaint incongruities extended to his dress. He walked in slovenly

splendor, but usually he was deep in debt. He was 'in wit a man, in simplicity a child,' generous also, though often abused. His complete works were published in 12 vols. in 1900. They show his amazing and graceful versatility. His fame rests chiefly on *The Vicar of Wakefield*, a novel; *The Good-Natured Man*, and *She Stoops to Conquer*; comedies; *The Deserted Village*, a poem. Consult biographies by Walter Scott, Macaulay, Prior, Washington Irving, W. Black (English Men of Letters Series), Austin Dobson, Forster, R. A. King and F. F. Moore.

**Goldsmith Beetle**, a large yellow beetle (*Cotalpa lanigera*) belonging to the chafer family (Scarabæidæ), occurring in the Eastern United States.

**Goldsmiths** are mentioned as one of the adulterine crafts in London about 1212, and the history of their progress and development is in the main that of the guild in general. The goldsmiths came into economic importance about 1645, and at that time began to receive money on deposit, and even to allow interest on it. These depositors early learned to draw bills on their bankers—the goldsmiths—and in this way the notion of a paper currency became familiar. Consult Jackson's *English Goldsmiths and Marks*.

**Goldsmiths' and Jewellers' Work.** The art of the goldsmith is an ancient one. From Egypt, Assyria, Greece, Etruria, Rome, and Cyprus, from Mexico and Peru, specimens of goldsmiths' work have been recovered, which demonstrate in striking manner the abundant skill, alike in design and in craftsmanship, of early workers in the precious metals. In the Egyptian sarcophagi, necklaces, rings, hair ornaments, bracelets, and chains are numerous, some dating from about 2000 B.C., all beautifully fashioned, and sometimes set with stones or pieces of glass resembling enamels. Early Greek specimens are largely composed of gold work only, stones and enamel being rarely used. Wreaths in which the leaves are of thin gold stamped to the proper shape and then fixed to a connecting band, are often found. The Etruscan work, which is of great beauty, is carried to a perfection which no modern efforts have excelled. Very characteristic work comes from India. Delicate ornaments of filigree are fashioned of fine wire into lace-like open work, richly set with stones and enamels. Benvenuto Cellini was the most famous worker in Florence, the 'Goldsmiths' City'; but most of the great painters and sculptors of the 15th and 16th centuries—Brunelleschi, Donatello, Ghiberti,

and others—received their first training in art in the goldsmith's shop. Benvenuto Cellini has given, in his *Autobiography*, a vivid picture of the life and work of the goldsmith of the Renaissance.

After the 16th century the goldsmiths' art declined, and the workers no longer ranked as the leading craftsmen of their time. Large factories exist for gold work in the great cities and capitals of the world, but there are many small workshops in which different branches are carried on. In the modern manufacture of goldsmiths' work machinery is largely employed, especially for less expensive jewelry, but in the higher branches the work is to a large extent carried on by hand. Consult Benvenuto Cellini's *Life*, and his *Treatise*; Theophilus' *Arts of the Middle Ages*; Smith's *Jewellery*; T. B. Wigley's *The Art of the Goldsmith and Jeweller*.

**Gold Stick**, officers of the British court. The office dates back to the reign of William IV., and is held by the colonel of each of the three regiments of household cavalry in rotation. The gold stick in waiting receives from the king personally the parole and the countersign, and reports direct to the king as well as to the Army Council.

**Goldthread**, a delicate creeping plant (*Coptis trifolia*) of the crowfoot family.

**Goldtit**, or **Verdin** (*Auriparus flaviceps*), a small bird of the Titmouse family found in the Western United States.

**Goldwyn, Samuel** (1882- ), motion picture producer, was born in Warsaw, Poland. His education in America was obtained in night schools. He organized the Jesse Lasky, Goldwyn, Madison, and Fitzmaurice Companies. He was the first producer to interest noted authors and musicians in motion pictures.

**Golf**, an outdoor game, thought to have originated in the 14th century, possibly of Dutch origin but generally identified with Scotland since the early Scottish game conformed closely with that of the present day. Golf is played on a specially prepared terrain. When inland the terrain is called a golf course; where it runs along the seaside it is called golf links. The first golf links are said to have been laid out along the seacoast and the game played by shepherds through the pastures and among the sand dunes. The grass close-cropped by the herds corresponded to our present fairways. Holes were placed in areas of fine turf corresponding to our putting greens and the sand dunes formed what are now bunkers and traps. The un-

cropped grass adjacent to the fairways formed what we now term the rough. Sand, water, or holes in the ground are called hazards.

The standard golf course or links consists of a series of eighteen playing areas each comprised of a *tee*, on which the ball is placed for the first shot called the drive; a fairway, which is the area of good turf between the tee and the putting green, and the putting green which is an area of finely kept turf in which a hole  $4\frac{1}{4}$  inches in diameter and 6 inches deep, is located. The tee for the following playing area is located near the putting green of the preceding hole. Generally speaking the word *hole* is used to describe an entire playing area including tee, fairway and green. The holes are numbered one to eighteen and are played in numerical order.

Each putting green is marked with a flag or pin which is numbered to identify the hole and serves to indicate the direction of play and the distance to the hole. The pin rests in a metallic cup fitted into the hole. The number of strokes which should be required to play a hole is calculated in accordance with a formula based on the length of the hole. The strokes required for a given hole are termed *par* for the hole. The total of par figures for eighteen holes is par for the course. Par always includes two putts or strokes taken on the green. Standard length golf courses have a par between 70 and 73 strokes. Until about 1920 there was a probable scoring figure known as *bogey*, which took into consideration not only the length of the hole, but its playing difficulties as well. Bogey figures were slightly higher than par and were intended to indicate what the average good player might expect to score.

The first golf balls were made by stuffing a hat full of feathers into a small horseshide cover and sewing the seams to form a small hard sphere. It was superseded about 1845 by the *guttie*, a ball made of solid gutta-percha. Because of the superior elasticity of the gutta-percha ball it could be hit farther and as a consequence the game was greatly improved. The guttie ball was used until about 1899 when Coburn Haskell of Cleveland, Ohio, invented a ball consisting of a live rubber core tightly wound with rubber bands over which a gutta-percha cover was compressed and joined. The present balls are improved beyond the original Haskell construction but are fundamentally the same. The rubber core of the earlier balls has been replaced with a liquid rubber compound which

is frozen during the manufacturing process and later liquefies, providing greater resiliency and preventing the ball from becoming unbalanced due to the rubber core being pressed out of shape in the winding process.

Since 1921 manufacturers of golf balls have been required to maintain certain standards of size and weight. For many years the specifications called for a ball weighing 1.62 ounces and having a diameter of 1.62 inches. In 1931 it was decided that the ball might be improved by reducing the weight to 1.55 ounces and increasing the size to 1.68 inches. It was thought that such a change would make the game more difficult for the expert players and at the same time easier for the less skillful ones. Theoretically the larger lighter ball could not be hit as far as those previously used and thus the playing qualities of the courses which had been designed for the less lively balls would be restored. The new specifications were criticized by players of all degrees and accordingly in 1932 the weight was changed to the original figure, although the larger size was retained. These changes were made only in the United States. England retained the original specifications.

Clubs used for stroking a golf ball vary in length and construction to provide for different types of shots. The earlier clubs were made entirely of wood. Ironheaded clubs were gradually introduced and now constitute the majority of a player's complement. Present clubs consist of a hickory wood or steel shaft and a wooden or iron head which is fitted to the shaft. Some modern steel-shafted clubs have a layer of rubber between the shaft and head which is said to cushion the hands and wrists from the impact with the ball. The more important clubs were originally identified by names such as driver, brassie, spoon, driving iron, midiron, mashie iron, mashie, mashie niblick, niblick and putter, the names being in the order of the length of shot for which they were used. In addition there are such clubs as the baffle, cleek, jigger and midmashie, which were used during the earlier years of the game, and some modern clubs which have appeared since 1920 such as the sand wedge, a heavy type of niblick, and freak clubs in which the angle of the face or loft may be adjusted, others which are designed to assist the player in hitting the ball properly.

During 1920 manufacturers began to number the clubs in accordance with the distance which a player was assumed to hit the ball

with each type. The driver, brassie and spoon became numbers 1, 2 and 3 *woods* respectively. The driving iron became number 1 *iron*, the midiron no. 2 *iron*, *marshie iron* no. 3, a *four iron* which fitted in between the *marshie iron* and *marshie*, the *marshie* no. 5, *marshie niblick* no. 6 and *niblick* no. 7. Clubs are sold by manufacturers in sets which are matched as to weight, length and balance. Such matched sets are assumed to increase the accuracy of the player since each club feels the same in the hands when swung. Expert golfers select their clubs with great care and often fit their own shafts and grips to their individual taste. The Royal and Ancient Golf Club of St. Andrews, Scotland, founded in 1774, is the parent body in the formulation of golf rules and specifications for clubs and balls. In the United States the U. S. Golf Association is the recognized authority. It is their purpose to preserve as far as possible the traditions of the game and to prevent the introduction of mechanical aids which would discount skill and experience.

There are two methods of competition in golf known as medal and match play. Medal competition is won by the player requiring the fewest strokes to complete eighteen holes. In match play each hole is won individually by the player using the fewest strokes and the player winning a greater number of holes than remain to be played is the winner. Thus in an eighteen-hole match a player who has won five holes more than his opponent upon completing the fourteenth hole is said to have won five up and four to play. A player with a lead equal to the number of holes remaining to be played is said to be *dormie*. If the competitors are tied or without advantage at the end of eighteen holes the match is continued, starting again with the first hole, until a hole is won and the winner thus decided. Golf players are divided into two classes for competition. An amateur is one who plays the game only for sport and derives no material advantage from his skill. A professional may be a salaried instructor, one who plays in tournaments or exhibitions for money or in other ways derives a monetary return for his play.

There are amateur tournaments, tournaments for professionals only and open tournaments in which both play. Among the more important tournaments are the annual invitation tournaments for club members and their guests, state, divisional and National amateur and open tournaments in the United States, and the British amateur and open

competitions. Also of importance are the annual tournament of the Professional Golfers Association, the international Walker cup amateur matches, and the Ryder cup professional matches. Open tournaments are always at medal play. Amateur tournaments consist of a qualifying round of eighteen holes followed by match play among the sixteen lowest scores. Tom Morris, Sr. of Scotland was the earliest outstanding tournament player of golf, having won the British Open tournament in 1861-62-64 and '67. His son, Tom Morris, Jr., followed, winning this tournament in 1868-69-70 and '72. Other well known British players were John Ball and James Braid. More recently Abe Mitchell, George Duncan, Harry Vardon, Ted Ray and Joyce Wethered have been prominent.

Foremost United States player was Robert Tyre (Bobby) Jones of Atlanta, Ga. Jones has won the British Open tournament three times, 1926-27 and 1930; the U. S. Open tournament four times, 1923-26-29 and 1930, and the U. S. Amateur tournament five times, 1924-25-27-28 and 1930. In winning all four major competitions in 1930, Jones made a record which had never been equalled. Francis Ouimet, Walter Travis, Jerome Travers, Charles Evans and Glenna Collett are leading American amateurs, while Walter Hagen, Gene Sarazen, John Farrell and McDonald Smith have been leading professionals.

U. S. National Open champions from 1930 to 1941 were R. T. Jones (1930), William Burke (1931), Gene Sarazen (1932), John Goodman (1933), O. Dutra (1934), S. Parks, Jr. (1935), Tony Manero (1936), Ralph Guldahl (1937, 1938), Byron Nelson (1939), Lawson Little (1940), C. Wood (1941).

U. S. National Amateur champions from 1930 to 1941 were R. T. Jones (1930), Francis Ouimet (1931), C. R. Somerville (1932), G. Dunlap, Jr. (1933), W. L. Little, Jr. (1934, 1935), John Fischer (1936), J. Goodman (1937), W. Turnesa (1938), M. Ward (1939), R. Chapman (1940), M. Ward (1941).

U. S. National Women Amateur champions from 1930 to 1941 were Glenna Collett (1930), Helen Hicks (1931), Virginia Van Wie (1932, 1933, 1934), Mrs. Glenna Collett Vare (1935), Pamela Barton (1936), Mrs. E. L. Page (1937), Patty Berg (1938), B. Jameson (1939, 1940), Mrs. F. Newell (1941).

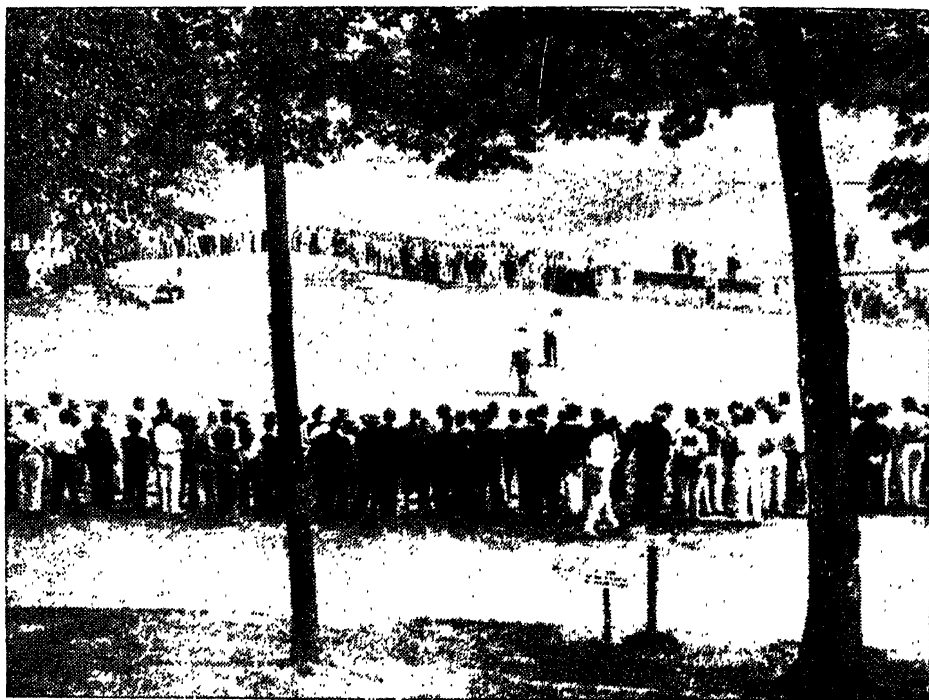
In 1942 there were 5,500 golf courses in the United States and about 3,000,000 players; of late there have been built many municipal and public courses. St. Andrews Golf Club in Yonkers, N. Y., founded in 1888, is

the oldest in the United States. Other long established clubs are Garden City, Shinnecock Hills, Fox Hills and Appawamas Golf Clubs in New York; Baltusrol, Englewood and Deal Golf Clubs and Morris County Country Club in New Jersey; Myopia Hunt Club of Massachusetts; Devon Golf Club of Pennsylvania; Glenwood, Ontwentsia, Exmoor and Chicago Golf Clubs of Illinois; Glen Echo of Missouri; Ekwanok of Vermont, and Newport Golf Club in Rhode Island.

ad co., p. 1,446. Situated in the 'coast prairie region,' it has exceptional grazing and farming facilities. Cotton and cottonseed oil are manufactured. In 1812-13 during the war between Mexico and Spain it was besieged and a 'massacre' took place.

**Goliardic Literature**, or **Carmina Burana**, in the later Middle Ages, songs of wandering students who called themselves Goliardi, i.e. followers of Goliath, about whom nothing is definitely known.

**Goliath**, the name of two Philistine giants,



*Golf Tournament Scene.*

**Bibliography.**—U. S. Golf Association, *Rules of Golf*; U. S. Golf Association Yearbook.

**Golgotha**, the scene of Christ's crucifixion, thought by some to be a knoll to the n. of Jerusalem, just outside the Damascus Gate. Others think the traditional site, the Church of the Holy Sepulchre, in the heart of the modern city of Jerusalem, is the correct one. The word Golgotha means, in Hebrew, 'skull' and its application here is believed to indicate that the place was the usual scene of execution or that it bore some resemblance to a skull.

**Goliad**, town, Texas; county seat of Goli-

ad. One challenged the army of Israel, and was encountered and slain by the youth David. The other was slain by Elhanan, a Bethlehemite. Some scholars believe Elhanan and David to be the same person and the second account to be the correct story, the first being only one of those myths which grow up around the name of every great man.

**Goliath Beetle**, a lamellicorn beetle belonging to the chafer family (*Scarabæidæ*) found in West Africa, and remarkable for its large size. The largest known species is *Goliathus giganteus*, which reaches a length



of 33 $\frac{1}{4}$  inches. It is velvety-black in color, with white markings.

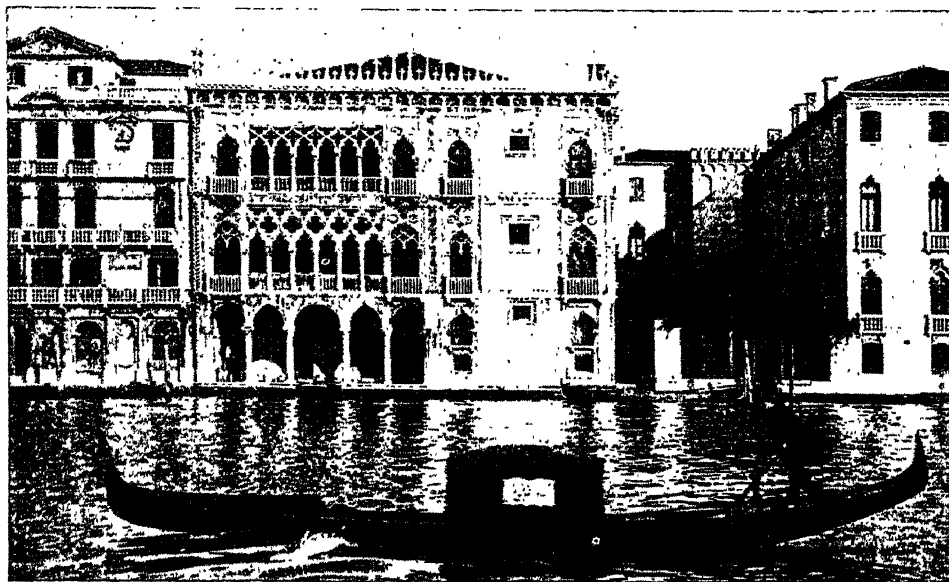
**Gollancz, Sir Israel** (1864-1930), English man of letters, was born in London. He became professor of English language and literature at King's College, London, in 1903. His edition of *The Pearl*, an old English poem (1891), was followed in 1892 by *Cynwulf's Christ*. He subsequently published *The Exeter Book of Anglo-Saxon Poetry* (1895), the *Temple Shakespeare* (1894-6), *Hamlet in Iceland* (1898), and other scholarly works.

**Golondrina**, a South American house swallow (*Tachycineta leucorrhoa*), green with white breast and rump.

on his writings, which include *Das Volk in Waffen*; *Van Jena bis Eylan*; *Kriegsgeschichte Deutschlands in XIX Jahrhundert* (1910).

**Gomez, Jose Miguel** (1853-1921), Cuban statesman, was born in Santa Clara province. He was active in two revolutions, was governor of his native province under the American military administration, and was elected to the same office in 1902. He was elected president of the republic by the Liberal Party in November 1908.

**Gomez y Baez, Maximo** (1826-1905), Cuban patriot and soldier, was born at Bani, Santo Domingo, of Spanish descent. He



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*Gondola on the Grand Canal, Venice.*

**Goltz, Kolmar, Baron von der** (1843-1916), German soldier, was born in Bielkenfeld, East Prussia. In the Franco-German war (1870-71), he served on the historical section of the General Staff; he was removed because of the radical views expressed in his *Gambetta and His Armies* (1877), and subsequently was lecturer on military history in Berlin. He became identified with the Young Turk movement (1908) and his reputation suffered a serious blow when Turkey met with defeat in the Balkan Wars. In the Great War he was governor of Brussels (September-October 1914) and supervised the defenses of the Dardanelles and the Turkish campaign generally. His fame depends chiefly

served in the Spanish army, but in 1888 joined the Cuban revolutionists, was made brigadier-general by General Agramonte, and was placed in charge of operations in Puerto Principe province. His daring operations soon gained him the name of 'the Terror.' On the outbreak of the revolution of 1895, he again took command, and carried on a successful guerilla contest until the American intervention in 1898. He placed his small army at the disposal of the Americans. The summer palace of the former governor-general was given him by the city council of Havana, and there, at Vedado, he died. Consult Carillo's *In the Saddle with Gomez* and Flint's *Marching with Gomez*.

**Gompers, Samuel** (1850-1924). American labor leader, was born in England. He came to the United States in 1863, and took a leading part, in 1877, in the reorganization of the cigar-makers, whose union became a model for all others. In 1881, when the Federation or Organized Trades and Labor Unions of the United States and Canada was organized, Gompers became chairman of the Committee on Constitution. He was also president of the Federation for three years, and when, in 1886, it was reorganized as the American Federation of Labor, he became president of the new organization, an office which he held until his death with the exception of a single year (1895). He represented the American Federation of Labor at the Peace Conference (1918-19). As leader of American labor for fifty years, Samuel Gompers believed that labor could best secure its aims through adherence to the existing political and economic order. He was editor of the *American Federationist*, and wrote: *Labor in Europe and America*; *American Labor and the War*; *Labor and the Common Welfare*; *Labor and the Employer*; *Out of Their Own Mouths*.

**Gonaives**, seaport town, Haiti. Here Desalines issued the declaration of Haitian independence (Jan. 1, 1804), and here the government and rebel forces met in battle in 1914; p. about 13,000.

**Goncourt, Edmond de** (1822-96), and his brother, **JULES DE** (1830-70), French novelists, the first-named born at Nancy, the second at Paris. They made their earliest literary attempts in *Histoire de la société française pendant la Révolution* (1854). The following studies, from the pen of Edmond Goncourt alone, are of more importance: *Gavarni, l'homme et l'artiste* (1873), *L'Art au XVIII<sup>e</sup> siècle* (1874), *L'Œuvre de Watteau* (1876), and *L'Œuvre de Prudhon* (1877). As novelists the De Goncourts share with their contemporary, Gustave Flaubert, the earliest place in the French realistic school. Chief among their novels are *Renée Mauperin* (1864), *Germinie Lacerteux* (1865), and *Madame Gervaisais* (1869). After the death of Jules, Edmond published *La fille Elisa* (1878), and *Lettres de Jules de Goncourt* (1885), followed by *Journal des Goncourt* (1887-92) and *L'Art japonais au XVIII<sup>e</sup> siècle* (1891-6). There exist English translations of nearly all their works. Edmond was the founder of the Goncourt prize. Consult *Lives* by Delzant (French), Belloc and Shed-

lock (English), and a critical study in Bourget's *Nouveaux essais de psychologie*.

**Goncourt Prize**, an annual prize of 5,000 francs provided for in the will of Edmond Goncourt to be awarded to the author, not yet publicly recognized, who shows distinct literary talent. The prize is awarded by the ten members of the Académie Goncourt, established at the same time.

**Gondar**, town, Abyssinia, capital of the former kingdom of Amhara. Of the greatest interest are the ruins of the royal palace, the castle, and a church. Gondar is the seat of the *abuna*, head of the Abyssinian church, and is the center of Abyssinian learning; p. 7,000.

**Gondola**, a long, narrow, flat-bottomed boat, used on the canals of Venice, the usual length being about thirty or forty feet. Gondolas are painted black, according to regulations dating from mediæval times. The gondolier stands in the stern, and propels the boat by means of a long sweep, while another gondolier sometimes stands at the bow.

**Gonds**, a Dravidian people numbering about 1,500,000, the most important of the non-Aryan or 'aboriginal' hill-races of the Central Provinces of India. Most of the upper classes are of mixed blood, and many of the race have embraced Hinduism; but they secretly retain many of their old superstitions. Both sexes limit their necessary attire to a cloth wound about the waist. The name Gondwana is still applied to the tract which they principally inhabit.

**Gonfalon** (a later form of *gonfanon*), a banner, a flag or streamers suspended from a horizontal bar, and used in religious and civic processions from very early times.

**Gong**, the disc of beaten metal with rim upturned to the depth of two or three inches, which serves as a bell in warfare and religious celebrations in India, China, and Java. Hence, any similar instrument.

**Gongora y Argote**, or, more correctly, **Arhote y Gengora, Luis** (1561-1627), Spanish poet, was born in Cordova. His early poems, particularly his sonnets, of which he wrote a great number on the Petrarchan model, are very fine, but his later style—the so-called *stilo culto*—is florid and pedantic.

**Goniatis**, a genus of fossil cephalopodous molluscs, belonging to the same family as the Ammonites. Some forms with slightly waved septa approach very near to the Nautilus. Many species are found in England and

America, in the Devonian and the Carboniferous.

**Gonidia** are propagative cells occurring in certain thallophytes (algæ, fungi, and lichens) independently of sexual organs, and ultimately separating from their parent.

**Goniometer**, an instrument used for measuring the angles of crystals. The *contact goniometer* consists of a graduated semicircle of metal at the centre of which two rules



Gongs.

1, Japanese; 2, Burmese.

are pivoted together. Between these the angles of large crystals with dull faces are measured. The *reflecting goniometer* is used for small bright crystals which reflect sharply defined images, and measures the angle between the normals to two faces.

**Gonorrhœa**, an inflammatory condition of the mucous membranes of the urethra and other genito-urinary passages, caused by a specific micro-organism, the gonococcus, which is present in the affected tissues and in the discharges from them. It is transmitted in the great majority of cases by sexual intercourse.

Announcement was made in 1937 that by use of a new drug, prontosil, Dr. John A. C. Colston, of Johns Hopkins University, could effect the cure of acute gonorrhœa in four days in 85 per cent of the cases treated. The disease also has responded well to sulfonamide therapy.

**Gonsalvo de Cordova, or Gonzalo Hernandez y Aguilar** (1453-1515), Spanish soldier, was born in Montilla (Cordova). He gained his first military experience in Portugal, at Albuera (1479), and in the war

with the Moors of Granada. In command of the expedition to Italy in support of Ferdinand of Naples (1495), Gonsalvo sustained the single defeat of his life, but ultimately drove the French from Naples, and won his title of the 'Great Captain.' Sailing again for Italy in 1500, he inflicted crushing defeats upon the French. Consult Prescott's *Ferdinand and Isabella*.

**Gonzaga, Luigi** (1568-91), canonized as St. Aloysius. He entered the Society of Jesus in 1585. At Rome, during a visitation of the plague, he gave himself up with unselfish devotion to the care of the sick, contracted the disease, and died. He was canonized (1726). He is the patron saint of students. His day is June 21. Consult *Life of St. Aloysius Gonzaga*, edited by E. H. Thompson.

**Gonzalez, Manuel** (1833-93), Mexican soldier and public official. He in 1861 joined Juarez against the European invaders. He was made brigadier general in 1867, and was governor of the palace in 1869-71. Diaz made him secretary of war in 1878. In 1880 he was elected president, but his administration was unsuccessful, and in 1884 he resigned in favor of Diaz. Afterward he became governor of Guanajuato.

**Good, James Williams** (1866-1929), American public official. In 1909 he entered Congress where he remained until 1921. In the latter year he resigned and resumed his law practice in Chicago and Washington. In 1929 he was appointed Secretary of War.

**Goode, John Paul** (1862-1932), Am. geographer, was born in Stewartville, Minn. He has done important work in cartography, having invented the interrupted homolographic map projection (1916), and the homolosine projection (1923), besides publishing several series of maps, a *School Atlas* (1923), and *Geographic Background of Chicago* (1926).

**Goodell, William** (1792-1878), American editor, was born in Coventry, N. Y. He became conspicuous in protesting against the Missouri Compromise, and in 1827 established an anti-slavery newspaper at Providence, R. I., called *The Investigator*. He afterward was interested in other similar newspapers. He is the author of *Views of American Constitutional Law* (1844), *The Democracy of Christianity* (1851), *Slavery and Anti-Slavery* (1852) and *The American Slave Code* (1853).

**Good Friday**, the Friday preceding Easter, the anniversary of Christ's passion and death. At an early date it was celebrated with a rigorous fast and special prayers. In the Roman

Catholic ritual for Good Friday the ordinary Mass is replaced by a Mass with a host consecrated on the previous day. The officiating clergy wear black vestments, the altars are stripped of all linen and ornaments, lights extinguished, all bells and instruments silenced.

In the Anglican Church also Good Friday is celebrated with special solemnity.

**Goodhue, Bertram Grosvenor** (1869-1924), American architect, was born in Pomfret, Conn. In 1891 he became associated with Cram and Wentworth, later with Cram and Ferguson, and after 1914, practised alone. He was particularly successful in ecclesiastical and academic buildings, among which are St. Thomas' Church and the Chapel of the Intercession, New York City.

**Goodnow, Frank Johnson** (1859-1939), American educator, was born in Brooklyn, N. Y. In 1883 he was appointed instructor in history and lecturer on administrative law at Columbia, where he was subsequently acting dean of the School of Political Science (1906-7). In 1914-29 he was president of Johns Hopkins University. His works include *Comparative Administrative Law* (1893); *City Government in the United States* (1904); *Principles of Constitutional Government* (1916); *China, an Analysis* (1926).

**Goodrich, Alfred John** (1847-1920), American musician and critic, was born in Chilo, O. He was educated in San Francisco and New York, taught classes in musical theory in New York and elsewhere from 1875 until 1900, and subsequently devoted himself to writing upon musical matters.

**Goodrich, Samuel Griswold** (1793-1860), American author, under the name of 'Peter Parley,' issued a great number of instructive and entertaining books for the young. From 1828 to 1842 he edited a successful 'annual,' *The Token*, in which the early productions of Hawthorne and other distinguished writers appeared. He served in the Massachusetts Senate in 1838-9, and was U. S. consul at Paris during President Fillmore's administration. From 1841 to 1854 he published a periodical entitled *Merry's Museum and Parley's Magazine*. Among his original books (the 'Parley' books being largely compilations), were *The Outcast*, and *Other Poems* (1836), *Recollections of a Lifetime* (1856).

**Goodspeed, Edgar Johnson** (1871- ), American Biblical scholar, was born in Quincy, Ill. After several years of teaching the classics, he became associated with the University of Chicago, where he became chair-

man of the New Testament department of the University in 1923. Among Professor Goodspeed's many publications are: *Ancient Sermons for Modern Times* (with G. Anderson, 1904); *The Story of the New Testament* (1916); *The New Testament—An American Translation* (1923); *The Making of the English New Testament* (1925).

**Good Templars, International Order of**, a secret society of both men and women, founded in 1851, devoted to the cause of total abstinence and the suppression of the liquor traffic.

**Good Will**, in law, a term employed to denote the benefits or advantages connected with a business, arising out of the tendency of the public to be influenced in their patronage by an established name, business reputation, location, and custom of dealing in the same place; or any other facts distinguishing it from other establishments in the same line, which may be deemed a commercial advantage. It is considered to have a distinct value, and is, therefore, recognized as property. It must be taken into account upon the dissolution of a partnership by agreement, and upon the death of one partner, the surviving partner must sell it with the other assets, if possible, and account for the proceeds. Sale of a business usually includes good will.

**Goodwin, Nathaniel Carl** (1857-1919), American actor, was born in Boston, and was given his first engagement by John B. Stetson—a minor part in the *Law of New York*, presented at the Howard Athenæum in Boston, in 1876. His performance brought him an offer from New York. From that time on he played comedy parts with increasing success. Among the plays and operettas in which he acted were *Pinafore*, *David Garrick*, and *Nathan Hale*, besides many of the standard comedies. He also played Shylock in *The Merchant of Venice*, Fagin in *Oliver Twist* (1912-13), and a long list of other rôles.

**Goodwin Sands**, sandbanks off the e. coast of Kent, England, stretching 10 m. n. and s. at a distance of 6 or 7 m. from the coast. They form a natural breakwater, sheltering the wide channel of the Downs from easterly gales.

These dangerous sands are said to have once been a low fertile island called Lomea, belonging to Earl Godwin, who lived and kept his fleets here; but in 1014, and again in 1099, the island was overwhelmed by a sudden inundation of the sea, which also did great damage in other parts of Europe. The tale is that, at the period of the Conquest by William of Nor-

mandy, these estates were taken from Earl Godwin's son, and bestowed upon the abbey of St. Augustine at Canterbury. The Abbot, having diverted the funds with which it should have been maintained to the building of Ten-terden steeple, allowed the sea wall to fall into a dilapidated condition; and so, in the year 1099, the waves rushed in, and overwhelmed the whole.

Many celebrated wrecks have taken place here, the most terrible having been the loss of an entire fleet of thirteen men-of-war, during the 'great storm' on the night of Nov. 26, 1703, on the Sands and neighboring shore. Consult Gattie's *Memorials of the Goodwin Sands*; Treanar's *Heroes of the Goodwin Sands*.

**Goodwood**, the seat of the Duke of Richmond and Gordon, on the South Downs, near Chichester, Sussex, England. The horse races for the Goodwood Cup have been run here annually since 1825, though the first race at Goodwood took place in 1802.

**Goodyear, Charles** (1800-60), American inventor, in 1834 began experimenting with methods of manufacturing india-rubber gum, then recently discovered, into a serviceable and permanent material. He devised and patented a process that at first seemed successful, and engaged in the manufacture of rubber goods, but the material proved not to be lasting and he failed and was reduced to poverty. One of his employees, Nathaniel Hayward, had observed certain effects of sulphur sprinkled upon rubber when left in the sun. The patent for this process Goodyear bought, and after experimenting for several years, he at last took out a patent in 1844 for the vulcanization of rubber by heating it with sulphur at a moderate temperature, a process which he discovered quite by accident. He devoted the remainder of his life to the perfection of the process, taking out many patents, which however were widely infringed. He died in poverty.

**Goodyera**, a former scientific name for the rattlesnake plantains, a genus of orchids now included in *Peramium*.

**Gookin, Daniel** (c. 1612-87), American colonial soldier and administrator. In 1651 he was speaker of the lower house of the legislature, and in 1656 was appointed superintendent of the Indians under the control of Massachusetts. After King Philip's War his opposition to the severe measures adopted against the 'praying Indians' rendered him very unpopular. He wrote in 1674 *Historical Collections of the Indians of Massachusetts*

(Mass. Hist. Coll. 1792), and in 1677, *An Historical Account of the Doings and Sufferings of the Christian Indians of New England* (American Antiquarian Society, 1836). He also prepared a *History of New England*, of which the MS. has perished. Consult F. W. Gookin's *Daniel Gookin* (1912).

**Goosander** (*Mergus merganser*), a member of the duck family (Anatidæ), one of the European mergansers. The bill and feet are red; the male has a greenish black head; a black back, and almost white wings, and is pinkish white beneath.

**Goose**, a name applied to a number of species of aquatic birds constituting the sub-family Anserinæ of the family Anatidæ, to which belong also the ducks and swans. The goose is of moderate size, somewhere between the ducks and the swans; the legs and neck are longer than in the duck, and the body not so flattened. The bill is rather high at the base and not longer than the head; the upper part of the beak is slightly hooked, and the lamellæ, characteristic of all the duck tribe, are short, tooth-like and altogether adapted to cropping the grass and other herbage on which the geese chiefly feed. The feet are short and completely webbed; the hind-toe is present; and the legs are placed comparatively far forward, so that the movements on land are less awkward than those of most ducks. When migrating, or on other long flights, they usually fly in a double line, converging to form a more or less perfect wedge led by a single gander. Their call is a characteristic *honk*.

The *wild geese* include thirty or more species belonging to nine or ten genera, widely distributed throughout the world but most abundant in the Northern hemisphere. Of the North American varieties the majority breed in the far north and winter south of Canada. The Canada Goose (*Brant canadensis*) is by far the most familiar American species.

Notable Old World geese are the Gray-lag Goose (*Anser cinereus*), the common species of Western Europe and the one from which the common domestic goose is believed to be descended; and the Egyptian or Nile Goose (*Alopochen ægyptiaca*), seen figured on ancient Egyptian monuments. The common goose has been long domesticated and is of great value for the table, for its eggs, and on account of its fine, soft feathers. It is somewhat larger than the wild bird and is generally gray, mixed gray and white, or white in plumage. The *pâté de foie gras* of Strasburg is made from goose livers in a state of morbid

enlargement, caused by keeping the geese in an apartment of very high temperature.

**Gooseberry**, the fruit of a hardy shrub of the genus *Ribes*, order Saxifragaceæ, cultivated in North America, Europe, and other temperate regions. The principal American species is *R. oxycanthoides*, extending across the upper North American continent from the Atlantic to the Pacific, and largely grown for market in the Central United States.

**Goosefish** (*Lophius piscatorius*), known also as the **Angler**, **Monkfish**, **Allmouth**, **Wide Gape**, **Kettleman**, **Fishing Frog**, **Sea Devil**, and **Bellows Fish**, occurs commonly in shallow waters on both coasts of the North Atlantic, ranging southward as far as Cape Hatteras and the Mediterranean. It is a large, clumsy, and singularly unattractive fish, reaching a length of from three to five feet. The goosefish is held in high esteem as a food fish in Great Britain and in Continental Europe. It has commanded no market in the United States.

**Gopher**, an American name properly restricted to the several varieties of Geomyidæ, known as pocket gophers, but commonly applied also to various species of ground squirrels or spermophiles. The Pocket or Mole Gopher is a sturdy little creature with a stout, compact body; a coat of soft silky hair, earthy brown in color, and external cheek pouches or pockets. The forefeet are armed with strong curved claws, and the upper front teeth are specially adapted for digging. The animal lives almost entirely underground, where it frequently runs its galleries to great distances, coming to the surface occasionally to throw out the loosened dirt. Once a year the male emerges to seek a mate, but for the remainder of the time the habit of life is solitary. One brood—usually of two or three young—is raised each year.

The pocket gopher feeds chiefly upon roots and tubers, and is extremely destructive to vegetables, trees, and farm crops. In North America pocket gophers are found from the interior of British Columbia as far south as Costa Rica. Their range covers the entire United States west of the Mississippi, as well as Southern Alabama and Georgia and Northern Florida. Consult Bailey's *The Pocket Gophers of the United States* (U. S. Division of Ornithology and Mammalogy, *Bulletin* 5).

**Gopher Snake**, or **Indigo Snake** (*Spilotes couperi*), a colubrine snake that inhabits the Southern United States. It is about

10 ft. long, black in color, with reddish markings. Like the king snake, it is believed to be an enemy of the rattlesnake.

**Gopher State**, popular name for Minnesota.

**Gopher Tortoise** (*Testudo polyphemus*), an inhabitant of Florida and other coast States of the Southern United States, that burrows into sandy soil during the day, and emerges at night in search of food. This tortoise is about 15 inches long, with shell of brown and black above, and yellow beneath. Both the tortoise and its eggs are highly valued by the negroes for food.

**Gopher Wood**, mentioned in Gen. vi. 14 as having been used in the construction of the Ark, has been identified with the cypress, with some kind of cedar, and with a resinous tree (Hebrew, *kopher*, 'resin,' or *gophrith*, 'pitch'). The name is also given to the Yellow Wood (*Cladrastis tinctoria*) of Kentucky, Tennessee, and North Carolina.

**Gopura**, in Hindu architecture, a pyramidal tower over the gateway of a temple.

**Gorakhpur**, district, United Provinces, India, forming with the districts of Azargarh and Basti the division of Gorakhpur. It is part of the great alluvial plain, and is watered by numerous rivers, the principal being the Rapti, Gogra, Great Gandak, and Little Gandak. The chief products are cotton, rice, and other food grains. As Gautama Buddha died within this district, it became the headquarters of Buddhism. It was ceded to Great Britain by Oudh in 1801. Capital, Gorakhpur; p. about 3,000,000.

**Goral**, one of the goat antelopes, inhabiting the Himalayas of Central Asia. It has a grayish coat, with black markings, and is about 27 inches high.

**Gorboduc**, or **Ferrex** and **Porrex**, the earliest English tragedy extant, written in blank verse, on the Senecan model, although the subject itself is British legend. It was written by Thomas Sackville and Thomas Norton, and performed before Queen Elizabeth by the gentlemen of the Inner Temple (Jan. 13, 1561).

**Gordian Knot**, a famous knot in Greek mythology. Gordius dedicated his car and yoke of Zeus, in the acropolis of Gordium, and tied the knot of the yoke in so skilful a manner that an oracle declared whoever should unloose it would be ruler of all Asia. When Alexander the Great came to Gordium he cut the knot in two with his sword, and applied the prophecy to himself.

**Gordianus**, the name of two Roman em-

perors. (1.) MARCUS ANTONIUS GORDIANUS AFRICANUS (158-238 A.D.). was descended by the father's side from the famous family of the Gracchi. The tyranny and injustice of the Emperor Maximinus excited a rebellion in Africa, and Gordianus was proclaimed emperor. The younger Gordianus, however, was defeated and slain in battle before Carthage, whereupon his father put an end to his own existence. (2.) MARCUS ANTONIUS GORDIANUS, grandson of above, was proclaimed emperor by the Prætorian Guard in 238, though then not more than fifteen years of age. Assisted by his father-in-law, Misi-theus, whom he made prefect of the Prætorians, Gordianus marched in 242 into Asia. Antioch, which was threatened, was relieved by Gordianus; the Persians were driven back beyond the Euphrates; and Gordianus was just about to march into their country when Misi-theus died. Philip the Arabian, who succeeded Misi-theus, thereupon stirred up the soldiery to assassinate the Emperor (244).

**Gordin, Jacob M.** (1853-1909), Jewish-American playwright and journalist, was born in the government of Poltava, Little Russia. In 1879 he founded at Elizavetgrad the Society of Spiritual Brethren of the Bible, an organization based upon ethics and without rites of any kind. This was suppressed by the government in 1891, and Gordin emigrated to New York, where he became a writer of plays for the Yiddish stage, his first work being *Siberia*, a study of Russian-Jewish conditions. Of his hundred or more other plays, the most famous are *Gott, Mensch, und Teufel* (1902), and the *Kreutzer Sonata*, the first Yiddish play to be presented on the stage in English.

**Gordius**, a genus of nematode worms of the parasitic order Gordioidea, the most familiar species of which is *G. aquaticus*, the HAIR WORM, HORSEHAIR WORM, or HORSEHAIR SNAKE of fresh water ponds and ditches, stagnant pools, etc. The adult worms are long (4 inches or more), slender, and flexible, dark brown or black in color, and often twisted into a complicated knot, not unlike a hair from a horse's mane or tail.

**Gordon**, a noble Scottish family of Norman descent, who settled at Gordon in Berwickshire in the 12th century. Sir Adam de Gordon (d. 1333) joined Bruce (1297), and, in reward of service against the Comyns, obtained from Bruce the lands of Strathbogie, Aberdeenshire, which he renamed Huntly. He was one of the ambassadors sent in 1320

to Pope John XXII. with the letter asserting Scottish independence; and he was killed at the Battle of Halidon Hill (1333). Among the more distinguished of his nearer descendants was the warrior Sir John Gordon, slain at Otterbourne in 1388. His grandson, Alexander, was in 1449 created Earl of Huntly. Alexander, third earl (d. 1524), established the predominant influence expressed in the phrase 'Cock of the North.'

Alexander's grandson, George, fourth earl (1514-62), in 1544 suppressed the Highland rising of the Camerons, Macdonalds, and Frasers. His son, George, fifth earl (d. 1576), was in 1563 sentenced to death for high treason, but was pardoned. After Mary's escape to Dunbar he succeeded Morton as lord high chancellor of Scotland (1566). A brother-in-law of Bothwell, he was deeply involved in the Darnley murder. His son, George, sixth earl (1562-1636), was in 1599 created marquis. In popular tradition a sinister flavor attaches to his name from the murder, in February, 1591-2, of the 'Bonnie Earl of Moray' of the old ballad. Lord George Gordon, one of Montrose's most brilliant officers, was killed at the Battle of Alford in 1645. George, fourth marquis (1643-1716), created in 1684 duke of Gordon, held the castle of Edinburgh in 1682 on behalf of James VII., but capitulated on June 14, 1698. Lord George (1751-93), a son of the third duke, achieved notoriety by his connection with the 'No popery' riots of 1780. On the death in 1836, without issue, of George, fifth duke, who in 1794 raised the celebrated regiment, the Gordon Highlanders, the title Duke of Gordon became extinct. Consult William Gordon's *House of Gordon*; Bulloch's *The First Duke of Gordon* (1909); *The House of Gordon* (ed. by J. M. Bulloch, 1903-12).

**Gordon, Charles George** (1833-85), known as Chinese Gordon and Gordon Pasha, British soldier and administrator, was born at Woolwich, Kent. Taking part in the expedition to China (1860), he participated in the capture of Peking, and suppressed the Taiping Rebellion. Returning to England, he was engaged in engineer duties at Gravesend. At the close of 1873 Gordon accepted an offer from Ismail, khedive of Egypt, to take up the work begun in the Sudan by Sir Samuel Baker, and he was appointed governor of the Sudan. In 1880 he resigned his command, and for a time saw service in Mauritius. Early in 1884 Gordon was again sent by the British government

to the Sudan, where the Moslem population had risen in revolt. A month after he reached Khartum, that place was invested by the troops of the Mahdi. Gordon heroically defended Khartum for several months; but he was killed two days before the relieving force came in sight. He was a man of profound religious faith. His memory is perpetuated in the Gordon Boys' Homes, and in the Gordon Memorial College at Khartum. Consult his *Journals* and his *Letters*.

**Gordon, Charles William** (1860-1937), Canadian author, clergyman, best known under his pen name RALPH CONNOR, was born at Indian Lands, Glengarry, Ontario. From 1890 to 1894 he was occupied as a Presbyterian missionary among the miners and lumbermen of the Rocky Mountains, where much of the local color in his novels was obtained. His published works include: *The Sky Pilot* (1899); *The Man from Glengarry* (1901); *The Prospector* (1904); *Breaking the Record* (1904); *The Doctor: A Tale of the Rockies* (1906); *Corporal Cameron of the Northwest Mounted Police* (1912); *The Major* (1917). In 1915 he was appointed a chaplain to the Canadian Forces at the front in the European War.

**Gordon, Daniel Miner** (1845-1925), Canadian educator, vice-chancellor and principal of Queen's University, Kingston, Ontario. In 1906 he became a member of the committee on union of the Presbyterian, Methodist, and Congregational Churches in Canada.

**Gordon, Lord George** (1751-93), English leader of the 'No Popery' riots of 1780 in London, was born in that city, son of the third Duke of Gordon. The riots originated in consequence of the removal of restrictions on Roman Catholics. On June 2, 1780, Lord George assembled a mob at St. George's Fields, London, to accompany him to the House of Commons to present a petition against the recent changes in the penal laws. The mob became violent; they held London in terror for thirteen days, and destroyed property to the value of nearly a million dollars. Lord George was arrested, sent to the Tower, tried for high treason, but acquitted on the ground of insanity. He afterward joined the Jewish faith, and died mad, some twelve years later, in Newgate jail. A vivid description of the riots is given in Dickens' *Barnaby Rudge*. Consult the *Life* by R. Watson.

**Gordon, Sir James Alexander** (1782-1869), British admiral. During the War of

1812 he served with Sir Alexander Cochrane on Chesapeake Bay (1813), and in 1814 was in command of a squadron which reduced Fort Washington and captured Alexandria.

**Gordon, John Brown** (1832-1904), American soldier and public official, was born in Upson co., Ga. At the beginning of the Civil War he entered the Confederate army and played a leading part in the successful Confederate attack on the first day of Gettysburg. He was U. S. Senator from 1873 to 1880, when he resigned to re-enter the practice of law. From 1886 to 1890 he was governor of the State, and from 1891 to 1897 was again a member of the U. S. Senate, where he was one of the prominent men of his party. He lectured on the Civil War, and wrote *Reminiscences of the Civil War* (1903).

**Gordonia**, a genus of trees and shrubs belonging to the order Ternstroemiaceae. The trees are evergreen, and bear beautiful flowers, usually five-petalled, white or cream colored. They like a peaty soil and plenty of water.

**Gordy, John Pancoast** (1851-1908), American educator, was born in Maryland, and in 1901 was appointed professor of education at New York University. He published: *The Growth and Development of the Normal School Idea in the United States* (1891); *New Psychology*; *A Broader Elementary Education* (1903); *History of Political Parties in the United States* (4 vols.).

**Gore, Christopher** (1758-1829), American lawyer and official, born in Boston, Mass. He was one of the commissioners to adjust the spoliation claims under Jay's Treaty, residing abroad for eight years. He was a member of the Massachusetts legislature (1806-09), governor (1809-10), and U. S. Senator (1814-17). At his death he left a bequest to Harvard College, which is commemorated by Gore Hall.

**Gore, Thomas Pryor** (1870- ), senator, was born in Webster co., Miss. When 8 years old he was accidentally struck in the left eye by a playmate and lost the eye. Three years later his right eye was lost through being hit by an arrow. He later practised law in Miss., Texas, and Oklahoma. He entered the U. S. Senate in 1907.

**Gorgas, William Crawford** (1854-1920), American army officer and sanitarian, was born in Mobile, Alabama. He obtained a doctor's commission in the army at the completion of his medical course, 1880. During the Spanish War and immediately following



it he was chief sanitary officer in Havana, Cuba, and there accomplished the work which first brought him into prominence, the clearing of that city of yellow fever. In 1904 he was selected by the Government to take charge of the sanitary administration of the Panama Canal zone, where in five years he succeeded in reducing the yellow fever death rate from 8,000 to 19. He was made U. S. Surgeon General in 1914, was promoted to Major General in 1915, and in that year became a permanent Director of the International Health Board of the Rockefeller Foundation, under whose auspices he accomplished the great task of exterminating yellow fever in Guayaquil, Ecuador. In the Great War, as head of the Medical Corps, he reduced the mortality rate in the U. S. Army to six-tenths of one per cent.

**Gorges, Sir Ferdinando** (c. 1566-1647), English soldier and colonizer, was born in Somersetshire. He became interested in the New World, and was a member of the Plymouth Company, to which, together with the London Company, permission to establish settlements was granted in 1606. In 1622 a grant was made to him and Captain John Mason of the territory between the Merrimac and Kennebec Rivers, and in 1639 the king granted him full governmental rights over the province of Maine.

**Gorgias**, of Leontini, in Sicily, Greek sophist, was born c. 480 B.C., and is said to have lived over a hundred years. He is especially famous as a rhetorician, and was one of the leaders in the formation of prose style.

**Gorgones, or The Gorgons**, in Greek myth three female monsters. Homer mentions only one, a frightful creature dwelling in Hades; but Hesiod speaks of three—Stheno, Euryale, and Medusa—dwelling in the Western ocean, though later legends placed them in Libya. They are described as encircled with snakes, winged, and with brazen claws and huge teeth.

**Gorgonidæ, or Sea Fans**, a family of corals, belonging to the division Alcyonaria.

**Gorilla** (*Gorilla savagei*), one of the four living types of anthropoid apes, and the largest of the Primates. It is confined to a limited area in Western Equatorial Africa and is entirely a forest animal, living apparently on various kinds of wild fruits, though it also robs the plantations of the natives. Of ferocious appearance, and in adult life, at least, of savage disposition, the gorilla is relatively little known. The few—always young

ones—which have been brought alive to Europe or America have soon died. The color is black to gray or brown, the arms reaching below the knees in the upright position. On the ground the gorilla ordinarily walks on all fours, with the fingers doubled in, and the toes either flat on the ground or also bent inward. The animals live in trees in small family parties, and construct rough sleeping platforms among the branches. See APE. Consult Hartmann's *Anthropoid Apes*; Elliott's *A Review of the Primates* (1913).



*Gorilla.*

**Göritz, Austria.** See **Gorz**.

**Gorky, Maxim**, pseudonym of ALEKSEI MAXIMOVITCH PYESHKOFF (1868-1936), Russian novelist, was born at Nijni-Novgorod. Gorky became prominent as a leader in the Russian revolutionary movement, and by his writings came under the attention of the Russian police as early as 1902. In January, 1905, he was arrested at Riga, and imprisoned for his activity at the time of the strike troubles. After his release he visited Finland, where his attendance on a meeting of Social-

ists obliged him to fly to Stockholm, whence he proceeded to Berlin and Zürich. At the latter place he received an invitation to visit the United States. He arrived in New York City in April, 1906, and lectured in that city on 'The Czar, the Duma, and the People' and on 'Antisemitism,' but returned to Russia in 1913, where he started a review. During the War he held pacifist sentiments and in 1917 gave a rather lukewarm support to the Bolsheviks which later became more unqualified.

Many of Gorky's novels, volumes of stories and plays have been translated into English under varying titles.

**Görlitz**, town, Germany, in Silesia, on the Neisse. Among notable features are several fine Gothic churches and a 14th century town hall. It is an important commercial centre, and has manufactures of cloth, mixed woolen goods, machinery, glass, bricks, and other commodities; p. 85,638.

**Gornergrat**, mountain ridge in the Monte Rosa group of the Pennine Alps, Switzerland, s.w. of Zermatt.

**Goroblagodat**, mining district of the Urals, Soviet Russia. Here gold is found in combination with platinum.

**Gort, Viscount, John Standish Surtees Prendergast Vereker** (1886- ), British army officer. He joined the Grenadier Guards, 1905; was wounded in 1914-18 World War, winning Victoria Cross and promotion to brevet major; chief-of-staff of British forces in Shanghai, 1927; director of military training in India, 1932-36. He was appointed commander-in-chief of field forces at the start of European War, 1939, and served as a member of the Allied War Council. He is known as "Tiger" Gort.

**Gortschakov, or Gorchakov, Alexander Michaelovitch** (1798-1883), statesman, born in St. Petersburg, was Russian ambassador at Stuttgart and at Vienna, 1854-6, and was appointed to the ministry of foreign affairs, April, 1856. After his appointments as chancellor, 1863, he was for some years the most influential statesman in Europe. But the repudiation of the treaty of San Stefano, framed by him, marked the decline of his power, and he was succeeded as foreign minister by De Giers, 1882.

**Gortuna, or Gortyna**, ancient city, Crete. Near the village of Hagii Deka, in 1884, Halbherr discovered a Greek inscription, which, taken with other fragments previously discovered, furnished a code of family law existent about 400 B.C.

**Görz, or Gorizia**, city, Italy, in the prov-

ince of Venetia Giulia. Features of interest are a 14th-century cathedral and the former castle of the counts of Görz. There are manufactures of silk, cotton, pottery, leather and candles. During the Great War Görz was the centre of severe fighting between Austrian and Italian troops and at length it was occupied by the Italians in 1916, but was evacuated in 1917; p. 26,334.

**Görz and Gradisca**, a former crownland of Austria-Hungary, lying between the Julian Alps and the northern end of the Adriatic. It formed part successively of the ancient Illyria and the duchy of Friuli; then from the 11th century it was a separate duchy, and belonged to Austria from 1550 to 1918, when it was captured by the Italians.

**Goschen, George Joachim, Viscount** (1831-1907), English statesman, was born in London. He entered the House of Commons in 1863, where he remained until his retirement in 1900. In the Salisbury government, 1886-92, he was Chancellor of the Exchequer and made his tenure of the office memorable by his scheme for the conversion and redemption of the National Debt, 1888-9. He published *The Theory of Foreign Exchanges* (1863; numerous eds.), and *Life and Times of G. J. Goschen* (1903).



GOSHAWK: Adult Female and Immature Bird.

**Goshawk** (*Astur palumbarius*), a species of hawk abundant in the forest regions of northern Europe and Canada, but rarely seen southward, except occasionally in winter. It is closely allied to the sparrow hawk which it closely resembles. It was one of the favorite hawks in falconry.

**Goshen**, a territory in ancient Egypt, the gift of Pharaoh to Jacob and his family, lying on the Pelusian arm of the Nile delta.

**Goshen, Republic of**, part of Bechuanaland, British South Africa; so designated by Boer filibusters in 1881.

**Goshen**, village, New York, county seat of Orange co., is the seat of Noah Webster School. Truck gardening is carried on and there are blue limestone and granite quarries; p. 3,073.

**Goslar**, town, Germany, in the province of Hanover. The Kaiserhuis, built in the 11th century is the oldest secular building in Germany. It was for two hundred years the place of residence of the German emperors. Immediately south of the town rises the Rammelsberg, in which silver, lead, copper, gold, zinc, and sulphur have been mined since the 10th century; p. 22,000.

**Gospel**, in the New Testament, signifies the 'good news of the kingdom,' or the 'good news of God through Christ'; with Paul it is sometimes equivalent to 'preaching of the good tidings.' See **GOSPELS**.

**Gospelers**, a word applied by the Roman Catholics of the period to Wycliffe and his followers; also to a class of people during the Reformation who considered that the doctrine of predestination, involving their ultimate salvation, absolved them from obligation to keep the moral law.

**Gospels, The Four**, purport to narrate the life and teaching of Jesus of Nazareth, and practically form our only documentary source of information regarding Him. They are traditionally associated with the names of Matthew, Mark, Luke, and John—either apostles or members of the apostolic circle—but with the exception of the fourth, they give no definite indication of their authorship. According to the fragments of Papias (c. 140) preserved by Eusebius, 'Mark, the interpreter of Peter, wrote down accurately though not indeed in order, whatsoever he remembered of the things said or done by Christ'; and Matthew wrote a collection of discourses of Jesus in Hebrew. The exact relationship of these works to our second and first gospels has been much disputed. The third gospel, which finds its sequel in the Acts of the Apostles, was ostensibly the work of the diarist of the 'we' passages in the latter book—Luke. John stands apart from the others, its contents, method, and style being very different from theirs. But there is a remarkable similarity amongst the first three,

in view of which, and from the fact that they give the same common summary and survey of the public life of Jesus, they have been aptly named the 'synoptics.'

The fourth gospel stands by itself. See **JOHN**, **GOSPEL ACCORDING TO**. Consult A. Wright's *Synopsis*; Westcott's *Study of Gospels*; Streeter's *The Four Gospels* (1924).

**Gospels, Harmony of the**, a comparison of the four evangelical narratives made for the purpose of exhibiting their mutual consistency, and combining them in a single connected history. The fourth gospel, which contains by far the largest mass of independent matter, can only be harmonized with the synoptics on the hypothesis of several visits of Jesus to Jerusalem, of which the latter give no hint. The real harmony, in truth, is not to be attained by forcing the gospels into a mere historic, let alone a verbal, concord, but is found rather in the marvellously self-consistent figure of Jesus, which the gospels, each in its own manner, portray. See **GOSPELS**, and, in addition to the works mentioned there, Waddy's *A Harmony of the Four Gospels in the Revised Version*.

**Gosport**, seaport town, England, in Hampshire, at the western entrance of Portsmouth harbor, of which naval port it forms a part. The industries include yacht building, and the manufacture of anchors, chain cables, and sails; p. 37,928.

**Gossamer**, the light filamentous threads which are found abundantly in autumn, both floating in the air, and also attached to the surface of bushes and plants.

**Gossan**, a Cornish miners' terms for oxid of iron and quartz.

**Gosse**, Sir Edmund William (1849-1928), English critic and miscellaneous writer, was born in London. He was appointed librarian to the House of Lords in 1904, a position he held until 1914. From 1884 to 1890 he was Clark lecturer on English literature at Trinity College, Cambridge. He visited the United States in 1884 and lectured at Yale, Harvard and Johns Hopkins Universities. His published works include *A Life of Gray* (1882); *Seventeenth Century Studies* (1883); *The Jacobean Poets* (1894); *Critical Kit-Kats* (1896); *Illustrated Record of English Literature* (vols. iii. and iv., 1903-4); *Life of Jeremy Taylor* (1904); *French Profiles* (1905); *Henrik Ibsen* (1908); *Silhouettes* (1925); *Leaves and Fruit* (1927).

**Göta**, canal, Sweden connecting the Katte-

gat with the Baltic by way of Lake Wener and Lake Wetter; and reaching the Baltic at Mem, below Soderköping.

**Göta**, river, Sweden, flowing from the southwestern end of Lake Wener, and reaching the Kattegat after a course of 68 m.

**Götarike**, one of the three historical divisions of Sweden, occupying the southern part of the country, and divided into 12 läns.

**Gotha**, town, Germany, in the republic of Thuringia. The dominant feature is the ducal castle of Friedenstein, 1643, crowning a hill south of the old town. Here also are the former ducal palace, the castle of Friedrichsthal and a famous museum containing many valuable collections. Here, too, is the geographical institute of Justus Perthes, which firm publishes the famous *Almanach de Gotha* and *Petermann's Mitteilungen*; p. 45,000.

**Gotham**, **Mad Men of**, heroes of one of the best known old English folk tales. The stories first appeared in print about 1550 under the title *Merrie Tales of the Mad Men of Gotham*. The name Gotham is applied to New York City, by Washington Irving in his *History of New York*.

**Gothard**, or **Gotthard**, **St.**, **Pass of**, Alpine pass, Switzerland, in the Reuss valley, canton of Uri (6,936 ft.). Known since the 13th century, it was an important highway from Germany to Italy.

**Gothenburg**, or **Gottenburg**, the second largest city in Sweden, capital of Göteborg and Bohus co.; features of interest are the statue of Gustavus Adolphus by Fogelberg, the new bourse, the King's Park, with Molin's group, *The Wrestlers*, the cathedral, the 'German' church, the museum and the town hall. The city has shipyards, machine-shops, sugar refineries, breweries, weaving and spinning factories. Gothenburg has a large trade, in which the principal exports are iron, timber, wood pulp, corn, butter, and fish. Gothenburg was founded by Gustavus Adolphus in 1619. At first it was peopled mostly by foreigners, especially Dutch; p. 276,000.

**Gothenburg System**, a plan for the regulation of the retail liquor traffic, first employed in Gothenburg, Sweden, and now in use in most of the cities and larger towns of Sweden and Norway. The system provided that a monopoly of the retail and bar trade in brandy be created and vested in a company consisting of persons who should receive no profit from the business, but should administer it solely in the interest of the

public. All profits above ordinary interest on capital necessary for operation were to go to the municipal treasury. Under the present Swedish laws a municipality may dispose at auction of licenses to sell brandy, or it may adopt the Gothenburg system, as above described. Profits from the trade are limited to six per cent. on capital invested; the excess of profits is divided between the municipality and the central government in proportions varying with the different municipalities, the greater proportion in every case falling to the municipality. The system has been successful in reducing the consumption of spirituous liquors; it has also been a success from a fiscal point of view, the fees and excess profits accruing to the treasury being generally much in excess of the revenue that would have been derived from licenses. The sale of beer was not included in the company's monopoly and it was not under its control but since 1919 the sale of wine has been under monopoly control. The sale of food with drink has been encouraged and the age-limit at which liquor could be sold has been raised.

The Gothenburg system as it exists today is now usually known as the Bratt system, due to its improvement by Dr. Ivan Bratt.

**Gothic Architecture**. See **Architecture**.

**Gothland**. See **Gotland**.

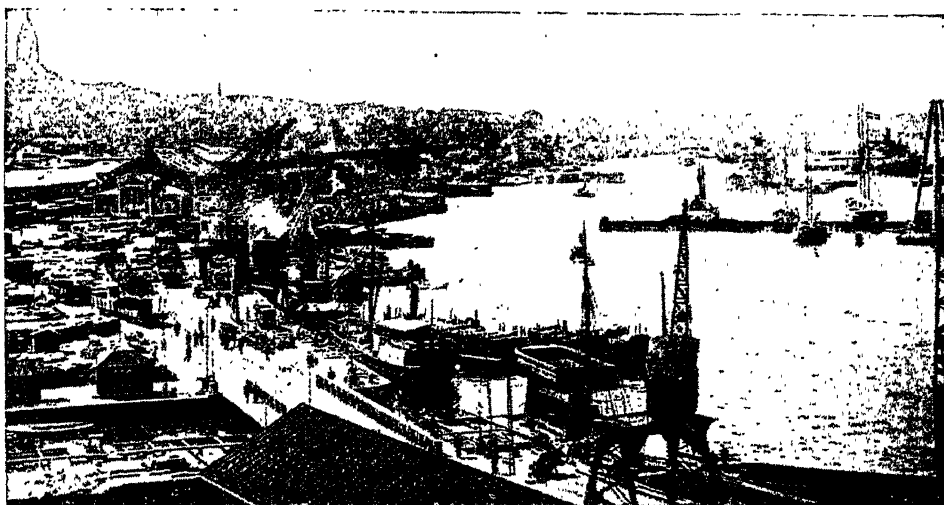
**Goths**, a people of Germanic race, who are first heard of on the southern shores of the Baltic. In the 2d century A.D. probably they migrated to the south carrying with them a number of smaller tribes, who are sometimes classed under the general term Goth—the Vandals, the Gepids, the Heruli, the Burgunds, and others. They first came into hostile contact with the Roman empire about the middle of the 3d century, and in a terrible battle at Abritta, 251, in Moesia the Romans suffered a crushing defeat, the Emperor Decius being among the killed. For the next eighteen years the Goths enjoyed unlimited opportunities for plunder in the Balkan peninsula and in Asia Minor, till they were checked, and eventually subdued, by the Emperor Claudius at Naissus in 269. His successor, Aurelian, made a wise treaty with the Goths, leaving them in undisturbed possession of the left bank of the Danube, and for one hundred years there was peace between them and the empire.

The Goths, under their king, Alaric, ravaged Greece. But Stilicho, ruler of the Western empire having intervened, Alaric in 402 invaded Italy, but was twice defeated and

forced to retire. In 408, Alaric again invaded Italy, and swept all before him. Rome was three times besieged, and the third time it was sacked and plundered, 410. Alaric died while engaged in the siege of Ravenna, and his successor, Ataulf, induced the Visigoths to turn their arms against his enemies in Gaul. His successors increased their territory, till under Euric they not only held all Gaul south of the Loire and west of the Rhone, but subdued the greater part of the Iberian peninsula. After the battle of Vouclad, near Poitiers, 507, in which they were defeated by Clovis, king of the Franks, the Goths finally abandoned all their French ter-

ritory except a strip on the Mediterranean. Henceforth they were a Spanish power. At length, their king, Reccared, 586-600, became a convert to Catholicism, the Visigoths were converted by battalions, and the clergy succeeded in making themselves supreme. The Ostrogoths, released from their servitude by the defeat of the Huns at Chalons, settled in Pannonia, along the middle Danube, and for a time were busy as enemies or allies of the empire, till their young king, Theodoric, obtained permission to invade Italy, as the agent of the empire, to drive out Odoacer, who had usurped the throne of the Western empire. This was with some difficulty accomplished, and Theodoric, in fact, if not in name, became king of Italy. After the death of Theodoric, the Emperor Justinian sent his

famous general, Belisarius, to subdue Italy. He had practically subdued the country when he was recalled, through court jealousies, to Constantinople. Although sent back to Italy in 544, he could effect nothing against the soldier and ruler of genius whom the Goths had made king over them. This was Totila, who rapidly recovered Italy. Justinian at last awoke to the seriousness of the task, and entrusted it to his aged chamberlain, Narses, who led a huge army to invade Italy from the north, and fought a decisive battle at Taginæ, where Totila was killed. Under the newly-elected king, Teia, the Goths made so desperate a stand at Mons



*Gothenburg Harbor, the largest in Sweden.*

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Lactarius, near Vesuvius, that the imperial general was glad to grant them a safe-conduct out of Italy. Thus ended their history as a nation. Consult H. Bradley's *Goths*; Hodgkin's *Italy and her Invaders*; Bryce's *Holy Roman Empire*.

**Gotland**, the largest of the Swedish islands in the Baltic Sea; is about 78 m. long and 30 m. wide. Agriculture and cattle-breeding, quarrying, and lime-burning are the chief occupations. As early as the 8th century Gotland was tributary to Sweden. In 1030 St. Olaf probably forced Christianity on the Gotlanders. Denmark and Sweden held the island alternately from 1361 to its definite cession to Sweden in 1645; p. 55,804.

**Goto**, or **Gotto**, group of islands, Japan, 50 m. w. of Nagasaki.

**Gottfried von Strassburg**, a German poet of the 13th century, author of an unfinished poem, *Tristan und Isolde*. Wagner's *Tristan und Isolde* is based on Gottfried's poem.

**Gottheil, Gustav** (1827-1903), Jewish rabbi, was born in Posen, Prussia. He was assistant to Dr. Samuel Holdheim at the Berlin Reform Temple from 1855 to 1860, when he accepted a call to the Manchester (England) Congregation of British Jews, officiating there until 1873. In the latter year he went to New York City as assistant to Dr. Samuel Adler of Temple Emanu-El, whom he subsequently succeeded as rabbi. Gottheil was the founder of the American Jewish Publication Society, and edited the first Jewish hymn-book published in the United States, 1886.

**Göttingen**, tn., Germany, in the province of Hanover. It is the seat of a famous university founded in 1737, and of the Academy of Sciences founded by Haller in 1751. Göttingen has manufactures of sausages, mathematical and scientific instruments, chemicals, books, and beer; p. 41,246.

**Gottschalk, Louis Moreau** (1829-69), American pianist and composer, was born in New Orleans, La. When still under twenty years of age he began to make concert tours in Europe, playing many of his own compositions. In 1853 he returned to the United States and played all over the country and in South America. He died, exhausted by hard work, in Rio de Janeiro. His compositions are noted for a happy blending of French and Creole characteristics. Among them are: *Bananier*, *Cradle Song*, *Last Hope*, and a *Tarantella* for piano and orchestra.

**Gottschall, Rudolf von** (1823-1909), German dramatist, novelist, and miscellaneous writer, was born in Breslau. Among his works are: *Ferdinand von Schill* (1851); *Pitt and Fox* (1854), *Katharina Howard* (1872); *Merlin's Wanderungen* (1887); *Welke Blätter* (1877; Eng. trans., *Withered Leaves*, 1879); and *Die Tochter Rübezahls* (1889). He was also author of a useful *Deutsche Nationalliteratur des neunzehnten Jahrhunderts* (1854; 7th ed. 1902), and *Zur Kritik des modernen Dramas* (1900).

**Gouania**, a genus of tropical shrubs belonging to the order Rhamnaceæ.

**Goucher College**, an institution for the higher education of women formerly known as The Women's College of Baltimore. It was established in Baltimore, Md., in 1885, and in 1910 was renamed Goucher College in

recognition of the large gifts and distinguished services of Rev. John F. Goucher, president of the college from 1890 to 1908, and his wife. The college course covers four years, and the degree of A.B. is conferred on its satisfactory completion.

**Gouda**, or **Ter Gouw**, town, Netherlands, in the province of South Holland. Features of interest are the museum, the weighhouse, and the Groote Kerk, founded in 1485, famous for its 16th-century stained glass; p. 28,612.

**Gouin, Sir Lomer** (1862-1929), Canadian public official and lawyer, was born in Grondines, Quebec. He became successively a member of the provincial legislature of Quebec, Commissioner of Public Works, Premier and Attorney-General of Quebec and during 1921-1924, served as Minister of Justice of Canada.

**Goujon, Jean** (c. 1515-72), sculptor of France, called 'the French Phidias.' Born probably in Paris, the first mention of him is in 1540, in connection with the building and decoration of the cathedral and church of St. Maclou, Rouen. Among his finest sculptures are the *Fontaine des Innocents* (1549, and bas-relief of the base being now in the Louvre), and the celebrated *Diane Chasseresse* for the Château Anet. There is a tradition that he fell in the St. Bartholomew massacre in 1572, but this seems to be without foundation.

**Gould, Augustus Addison** (1805-66), American zoologist, was born in New Ipswich, N. H. He was a founder of the Boston Society of Natural History and a member of many other learned societies. Among his numerous writings were *Mollusca and Shells* (1846) and *The Mollusca of the North Pacific Expedition* (1860).

**Gould, Benjamin Apthorp** (1824-96), American astronomer, born in Boston, Mass. He founded, 1849, the *U. S. Astronomical Journal*, edited it until 1861, and resumed its publication in 1885. From 1852 to 1867 he carried out important astronomical observations for the government, to determine the exact positions of prominent stations on the Atlantic coast. Between 1855 and 1859 he directed the Dudley Observatory at Albany, N. Y., and introduced important improvements in the construction of the meridian circle and other astronomical instruments. He went to Argentina in 1870, at the request of the government of that country, and established an observatory at Cordoba. Remaining there until 1885 he made extensive as-

tronomical and meteorological observations and established a chain of recording stations over South America. His best known publications are as follows: *Report on the Discovery of the Planet Neptune* (1850), *Discussions of Observations Made by the U. S. Astronomical Expedition to Chile* (1856), and star charts giving the positions of over 83,000 stars.

**Gould, George Jay** (1864-1923), American capitalist, was born in New York City. He was early introduced to railway management, and became president of the Manhattan Elevated Railway Company of New York in 1892; he also became president of many other railroad companies, and of the Western Union Telegraph Company.

**Gould, Jay** (1836-92), American financier, was born in Roxbury, N. Y. He attended Hobart Academy, where he worked to pay for board, and at fifteen began to clerk in a hardware store, studying surveying at night. Engaging in the leather and lumber business in 1856, he sold out in 1857, and bought control of a small bank in Stroudsburg, Pa. Shortly afterward he bought a controlling interest in the Rutland and Washington Railroad, with which he consolidated the Rensselaer and Saratoga, and sold at an enormous profit.

Meanwhile he became interested in western roads, including the Union Pacific, the Wabash, the Texas Pacific, the Missouri Pacific, and others, and by 1880 controlled 10,000 m., more than one-ninth of the entire mileage of the country. He was instrumental in combining the telegraph companies into the Western Union in 1881, and secured control of the elevated railroads of New York City the same year. He and his partner, 'Jim' Fisk, are held responsible for the 'Black Friday' panic of 1869. At his death his fortune of over \$70,000,000 was left to his family.

**Gounod, Charles François** (1818-93), French musical composer, was born in Paris. He was awarded the Grand Prix de Rome for his cantata *Fernand* in 1839. For eight years, 1852-60, he was conductor of the Orphéon in Paris, for which society he composed several choruses and masses. He produced *Le médecin malgré lui* (1858); *Faust* (1859); *Mireille* (1864); and *Roméo et Juliette* (1867). Among his masses the finest is *St. Cecilia*, composed in 1882; his cantata *Gallia*, 1871, also has great merit. Consult *Prud'homme's Gounod: Sa vie et ses œuvres*; his own *Mémoires d'un artiste*; Imbert's *Charles Gounod*.

**Goura**, a genus of large pigeons whose members are found exclusively in the Papuan and Solomon Islands. They are bluish gray in color, with chestnut brown on back and wings; and have a beautiful fan-shaped crest.

**Gourami**, or **Gurami** (*Osphromenus ol-fax*), a fish belonging to the family Labyrinthici, celebrated for its fine flavor. Its original home is the rivers and streams of the East Indian Archipelago. It has an oblong, oval body of a greenish brown color, banded by dark, vertical stripes in the immature fish. Though generally about two feet in length, it sometimes attains a length of six feet.

**Gourd**, a name given to various species of the plant genus Cucurbita. All are annual climbing plants, with tendrils, broad leaves large yellow monœcious flowers, and fleshy fruits. Important commercially are the Pumpkin, Cucumber, Squash, Melon, and Vegetable Marrow.

**Gout** is a constitutional disease, characterized by attacks of acute arthritis, by gradual deposition of crystals of urate of sodium around the joints, and by various irregular symptoms displayed in other parts of the body. Among the factors of causation are deficiency in the oxidation of food within the body, and diminution in the elimination of waste tissue products. Other elements in the causation, however, are heredity, sex, age, habits as to food and drink, occupation, and the presence of lead in the tissues. The acute form of the disease is rarely seen in patients under the age of thirty.

**Goutweed**. See **Bishopweed**.

**Govan**, a police borough of Lanarkshire, Scotland, on the south bank of the Clyde, adjoining the municipal boundaries of Glasgow, and about three miles west of its center. Its shipbuilding yards are among the largest on the Clyde; p. 89,725.

**Government** may be defined as the means through which an organized political society realizes the end for which it exists. In determining the best form of government for a particular society, the special circumstances—historical, racial, geographical and economic—have to be taken into consideration. From the days of Aristotle the world has been familiar with his famous classification of governments into (1) Monarchy, or government by a single person; (2) Aristocracy, or government by a select council; (3) Democracy, or government by the many. Modern writers are not prone to adopt any forms of classification of forms of govern-

ment beyond that into parliamentary and non-parliamentary, or some other division designed to reveal the degree to which the principles of representation are involved. Most governments of today are constitutional in form, and as such are subject to varying degrees of popular control. The essence of a constitutional government is that the executive powers are limited by legal restrictions contained in a written or conventional constitution, and such prerogative powers as may remain to it are, for the most part, popular privileges. Constitutions may be classified as either rigid or flexible, according to the degree of difficulty with which they can be changed. In most countries any change in the constitution requires a special procedure attended with greater formal difficulty than that of the ordinary mode of legislation. The Constitution of the United States cannot be amended without the consent of two-thirds of Congress and three-fourths of the States. In England, however, only the authority of an act of parliament passed by the same procedure as any other measure is necessary. The degree of rigidity varies considerably in different modern governments.

Governments may be further classified into unitary and federal types. The unitary State has but one legislature which makes laws of universal validity for all its citizens and subjects, and one executive to administer and one judiciary to interpret these laws. Among the governments exemplifying this type are those of France, Great Britain and Belgium. The federal State, on the other hand, is composed of several individual states, each of which preserves its individual sovereignty, its own laws and government. The nation as a whole, comprising the total population of the individual States and leaving these states as such out of account, forms a federal State which also possesses a complete government, and of which the citizens of the individual States, are also citizens. The governments of the United States and of Switzerland are of this type.

Still a further method of classifying modern democratic governments is to divide them into those with a parliamentary, and those with a non-parliamentary executive. The parliamentary form is that of the French and British governments, which means that the ministers of State, in charge of the executive offices, are chosen from, and are responsible to, the members of the Legislature or Parliament or Chamber of Deputies, as they are variously called. This form is the

direct outgrowth of a party system. A popularly elected legislature upon this basis is, of course, divided into a majority and a minority. The leader of the majority, upon the victory of his party, becomes premier or prime minister, and he selects his colleagues who fill the ministerial posts. The responsibility of the ministers to the legislature is primarily a responsibility to the party of which they themselves are members, and their continuance in office depends upon their ability to command the confidence of their party.

In a non-parliamentary government using the United States as an example, the chief executive is elected by a different procedure and for a different term than the members of the legislature. He chooses his own ministers, subject to the approval of the Senate, and these must not be members of either House of Congress. The president is not responsible to Congress (as in the parliamentary system) in the sense that an adverse vote in either will cause his resignation. Neither are the ministers responsible to the legislature except for the one provision, that they, like the president, are impeachable, they are responsible to the president himself who may dismiss them at will. The division of legislative bodies into one or two chambers (bicameral or unicameral) affords a further distinction between States. In a bicameral system one chamber is usually representative of the component states. Each State, regardless of size or population, has equal representation with all of the others. The second chamber is composed of representatives of equal numbers of citizens, regardless of State boundaries. In a unicameral system there is but one legislative body. The vast majority of modern governments have bicameral constitutions—Yugoslavia and one or two of the new Balkan States, however, have unicameral constitutions.

Since the World War a new form of government has appeared in Italy and Russia, which differs from any discussed thus far. Italy has adopted Fascism and Russia, Bolshevism or Communism. These forms exhibit certain common characteristics. Both explicitly repudiate rule of a majority based upon the common method of party organization. Both doctrines substitute the dictatorship of a minority for that of parliamentary representation. They further agree upon an integral relationship between the social function of the individual and his political representation. They differ, however, in one



major respect. The Communist functional organization of the State on an occupational basis has definitely aimed at elimination of the individual capitalists, who have been replaced largely by the State itself. The Fascist State definitely places the interest of the State before that of any individual, but does recognize both employers' and employees' associations, so long as they are adherents to Fascism. Nazism, in Germany, is a more recent totalitarian form, quite similar to Italian Fascism, except there is no King to stand nominally above the Dictator. See Fascism; Communism. *Bibliography*.—Earl Grey's *Parliamentary Government*.

**Government, Commission.** See **Commission Government**.

**Government Control of Industry.** Very early in history, governments began to lay down rules for the guidance of economic conduct. It became an important function of governments to protect people from economic oppression and to enforce obligations between groups or persons. Along with the development of economic society we can trace the changes in the theory and practice of government control of industry. The great civilizations of the ancient world were basically military and the activities of government corresponded to this situation. There was a minute regulation of all aspects of everyday life, often enforced through religious codes. In the Grecian city states the interests of society were paramount. Public regulations pertaining to certain aspects of production were common and such direct regulations included the inspection of weights, measures and of goods offered for sale. The price of salt was regulated, and the exportation of wheat forbidden. The slaughter of sheep and goats during lambing time was prohibited.

The Romans, although influenced by Greek ideas, developed a system of jurisprudence which through its doctrines concerning property, contract, usury, '*caveat emptor*,' and the like, gave a greater freedom to economic enterprise. The state, however, interfered in a practical way to inspect goods placed on sale in Roman markets, to fine merchants who by hoarding raised prices, to regulate the prices of oil and to present the exportation of precious minerals. The great contribution of Roman thought was, however, the *corpus juris civilis* which had a great influence upon later legal systems.

In the absence of strong central governments, control over industry in the Middle

Ages was exercised through the feudal manor system, the guilds, local town governments and the church. The *justum pretium*, a price which would allow the producer to maintain himself in his class status, was upheld. 'Usury' was condemned as immoral. All the forces of guild, city, manor and church combined to regulate in detail all economic activity in the Middle Ages. By the beginning of the 16th century, the decline of church and feudal power together with the rise of nationalism resulted in a new economic policy which aimed to increase public revenue and national wealth. This policy was mercantilism, and was followed in France, Prussia and England. Keen military and commercial rivalry led to emphasis on wealth and resources, and developed the belief that it was desirable to increase the stock of precious metals within a country, to maintain a favorable balance of trade, to increase population and foster manufactures, even at the expense of agriculture if necessary. The policy was expressed in innumerable laws and regulations concerning trade, manufacture, navigation, tariffs, agriculture and colonies. These restrictions became more onerous as industry developed, and many industries found themselves hindered by the very laws which had protected their infancy.

Reaction against mercantilism was first expressed toward the end of the 18th century by the French physiocrats, a school of thinkers who taught the doctrine of natural laws and rights, and as a consequence the doctrine of *laissez-faire*. Simply expressed, *laissez-faire* called for the least possible amount of interference by government in economic affairs. Naturally the physiocrats were ardent advocates of free trade. The new point of view soon became dominant. It was ably expounded by Adam Smith in his *Inquiry into the Nature and Causes of the Wealth of Nations* (1776). His writings in many respects resemble those of the physiocrats, although the doctrines of free trade, non-interference and natural laws are stated more carefully.

The three main functions and duties of government, according to Smith, were: the protection of the nation against foreign violence or invasion; the protection of the individual within the nation through administration of justice; the establishment and maintenance of certain public works which are profitable to a great society but not to the individual. These public works were divided into those promoting trade and commerce, such as streets, canals, and harbors,

schools to educate the young, and the church to educate the entire people. The result of Smith's doctrines was to strengthen and emphasize the laissez-faire trend of thought, and to aid in England and elsewhere in the removal of numerous restrictions on trade and industry. The laissez-faire doctrine became a fundamental thesis of the English classical school of economists, which reached its fullest development in John Stuart Mill. Originally a thorough advocate of the free competition, Mill in his later years saw defects in the doctrine, and favored several socialistic measures. In fact, Mill's views on the extent of government interference in industry show him basically a believer in laissez-faire, to which however he made exceptions. Since the time of Mill few economists have upheld laissez-faire in its entirety. Indeed in 1870 Cairnes made a bold frontal attack upon the principle.

But the doctrine of laissez-faire had not been accepted everywhere. The ethical and political views of the orthodox political economy were criticised by socialist writers, beginning with William Godwin in 1793. Socialism was in essence a thorough protest against private property and laissez-faire. The objections of socialists pointed out weaknesses in the application of the laissez-faire policy and influenced Mill and following writers. Ultimately, socialism aided in the reaction against laissez-faire. The philosophy of individualism found ready acceptance in the New World, where conditions were ideal for its practical application. The United States was born in revolt against governmental interference. People were accustomed to frontier freedom. Abundant economic opportunities made control less necessary. In keeping with this pioneer spirit, government regulation of business for three quarters of a century was negligible. Although free trade was never established there, the policy of laissez-faire flourished in the United States much longer than in European countries. Even today there remains a widespread feeling of antipathy toward government interference with individual economic affairs.

The transformation of economic organization since the time of Adam Smith has created new economic and social problems. The replacement of small businesses and of individuals engaged in production, by huge organizations, the rise of a working class, the increasing dependence of the public upon the market for supplies have been character-

istic of the change. This was first recognized in England by the passage of the Factory Acts, 1802-1847, which were designed to improve the status of the laborer. Since then England has gone far toward the socialization of industry. In the United States, control of industry has developed largely since the Civil War. The rapid growth of the railway net was marked by political corruption, cutthroat competition, financial manipulation, oppressive rates, discriminatory service and in general 'the public be damned' attitude. The first strong reaction against these abuses was the Granger movement of the early 'seventies.' Several Middle-Western States, spurred on by farmers' organizations, passed laws applying to railways and warehouses intended to control rates, eliminate abuses and prevent combination.

The Granger movement was a forerunner of the Federal control establishment through the Interstate Commerce Commission in 1887. The Interstate Commerce Act provided for just and reasonable charges, forbade discrimination in rates or service between persons or localities, forbade a greater charge for a short haul than for a long, prohibited pooling and ordered that all fares and rates be made public. The law is administered by the Interstate Commerce Commission, whose powers and duties have been increased from time to time by additional legislation, notably by the Elkins Act (1903), Hepburn Act (1906), Mann-Elkins Act (1910) and the Transportation Act (1920). The net result of these acts is that railways are closely controlled with regard to rates, earnings, financing, service, and labor. The regulation of local monopolies, such as gas, water, electricity, telephone and street railways, developed more slowly. The outcome was the establishment of state control, in the form of public service commissions of a mandatory type beginning in 1907. These commissions have been developing a theory of public utility regulation and have been effective in remedying the breakdown of laissez-faire with regard to those industries over which they have jurisdiction.

The policy of the United States government toward ordinary industrial organizations has always been one of enforcing competition in order to bring about the results promised by the laissez-faire doctrine. In the United States, the Sherman Act was passed in 1890 to codify and stiffen the old common law prohibitions against monopoly and restraint of trade. The Sherman Act was in-

effectually enforced during the nineties. Industrial combinations and artificial monopolies flourished and took full advantage of their power to profit at the expense of consumers. In consequence, a revival of anti-trust activity took place under President Roosevelt who advocated a 'trust busting' policy. Suits against several companies were successfully completed. A peak was reached in 1911 with the dissolution of the Standard Oil Company and the American Tobacco Company.

Under President Wilson's leadership additional legislation was enacted in 1914. The Clayton Act prohibits certain specific competitive practices, to that extent removing doubt as to what can or cannot be done. The Federal Trade Commission Act makes illegal unfair methods of competition, and establishes a Commission for the purpose of keeping the channels of interstate trade open to free and healthy competition. Later developments indicated a changed philosophy of control on the part of the government. The activities of the Federal Trade Commission revealed a sympathetic attitude toward the efforts of business to eliminate unethical or unfair competition. A company which, because of the huge scale of its operations, influences competition in an industry, is no longer subject to the penalties of the anti-trust laws because of its size alone. Consolidation of railways is favored in the Transportation Act of 1920.

The tremendous development of motor transport since the war has given rise to problems of regulation. Commercial motor vehicles are now regulated in most States, usually by public service commissions. Federal regulation since the war has dealt with meat packing, stockyards, radio communication and aviation. In 1921 Congress enacted the Packers and Stockyards Act, under which the Secretary of Agriculture has jurisdiction over competitive practices in the packing industry. He has power to regulate stockyards but not packers, as a public utility. The act has been adjudged legal, at least in so far as it pertains to stockyards, in the case of *Stafford vs. Wallace* (1922).

Radio communication was used before and during the Great War, and broadcasting did not develop on a popular scale until after 1920. A widespread demand for control finally culminated in the Radio Act of 1927. It authorized the creation of a Federal Radio Commission with powers to grant or revoke licenses on the basis of public convenience,

interest or necessity. In addition the Act regulates chain broadcasting systems; prohibits restraint of competition in the general field of communications by use of radio; requires that stations giving service to any political candidate must afford equal facilities to other candidates for the same office. The Davis Amendment of 1928 requires the allocation of broadcasting facilities equitably to five regional zones. Within the zones, apportionment is to be made according to the population of the component States.

Commercial air transport during its early days was handicapped by lack of supervision which would promote safety, and provide a sound basis for development. The Air Commerce Act of 1926, passed to meet these needs, vests the function of aiding and regulating aviation in the Secretary of Commerce. In addition the act provides for the promotion and development of air commerce by government surveys and dissemination of information on airways and airports, and weather conditions. State laws supplement Federal regulation of aviation, since they apply to intrastate air commerce, and non-commercial flights. The result has been a steady and sound growth of air commerce in the United States.

The theory and practice of government interference with industry ordinarily refer to peace time conditions. War time control is an exception. The actual time during which war is waged in modern times is relatively short. The United States has been engaged in war during eleven of the one hundred and forty-one years of its existence. Nevertheless it is in war that the relationship between government and business becomes extremely close. Modern wars demand a steady flow of equipment, supplies and men in such huge amounts that the economic resources of warring nations are utilized to their fullest extent.

During the World War the United States faced the problem of distributing resources between essential civil and military uses, and in addition supplying its allies with war materials. Only centralized control through Federal boards, commissions or corporations made this possible. The War Industries Board dealt with problems of manufacture and distribution of necessary commodities. Through its Price Fixing Committee it established prices intended to insure a steady flow of goods. The War Trade Board regulated commerce and foreign trade, while the War Finance Corporation supervised the dis-

tribution of credit to war industries, and the Capital Issues Committee was created to pass upon proposed issues of stocks and bonds. A more intensive control was established over the shipping and ship building industries, through the Shipping Board and the Emergency Fleet Corporation. Government operation of railways is another illustration of the subordination of individual interests during wartime. Control over food and fuel distribution was also established.

More recent Federal legislation designed to extend government control over industry, even in peacetime, includes the Securities Exchange Act of 1934, the National Labor Relations Act of 1935, the much debated Fair Labor Standards Act of 1938, and the wartime Connally-Smith Anti-strike Bill of 1943. The latter was passed by Congress (June 25), over President Roosevelt's veto, after coal miners had struck a third time in seven weeks. Industry and the country generally suffered greatly from sit-down strikes following enactment of the National Labor Relations Act.

**Bibliography.**—Consult G. B. Clarkson's *Industrial America in the World War* (1923); A. J. Swenson's *National Government and Business* (1924); L. H. Haney's *History of Economic Thought* (1927); Crecraft's *Government and Business* (1928).

#### **Government Land.** See **Public Lands.**

**Government's Island**, Illinois, in the Mississippi River, opposite Rock Island City. It contains U. S. armories and arsenals.

**Governor**, supreme executive of a State or colony. A governor is the chief executive of a State or Commonwealth, in the United States. He is elected by the citizens of the State, and his rights and duties are those general administrative duties usually associated with the head of the executive department in any republican form of government—the appointment of certain classes of officials, the exercise of the pardoning power and the right of veto, and the command of the State militia. The tenure of office and limitations upon the governor's powers vary from state to state.

**Governor** of a steam engine, a device for regulating the speed of the engine under varying conditions of load and pressure. See **STEAM ENGINE**; **GAS ENGINES**.

**Governors, House of**, an annual conference of State governors of the United States—the outcome of the conference of State executives called by President Roosevelt in 1907 to consider the question of conservation.

**Governor's Island**, in New York Harbor, off the southern end of Manhattan Island; area, 173.35 acres. It is Federal property and Headquarters of the First Field Army and of the Second Corps Area of the U. S. Army. Fort Jay is located here, also Castle Williams, now a military prison, and South Battery, used as an officers' club. Of interest are the Clock Tower Building and the Chapel of St. Cornelius the Centurion.

**Governor's Island**, fortified island in the harbor of Boston, Mass. It is occupied entirely by the Government for purposes of national defence, the chief fortification being Fort Winthrop.

**Gower**, or **Gwyr**, peninsula of Glamorganshire, South Wales. On the coast are the famous bone-caves in which deposits of animal remains and some traces of man have been found.

**Gower, John** (c. 1330–1408), English poet, was born in Kent co. Gower's literary productions consist of three long poems—the *Speculum Meditantis*, written in French; the *Vox Clamantis*, written in Latin elegiacs about 1382; and the *Confesio Amantis* (c. 1390), written in English octosyllabic verse. He also wrote fifty French ballads, assigned to his latest period. The influence he exerted on English literature up to the age of Shakespeare is second only to that of Chaucer. See G. C. Macaulay's *Works of John Gower—French and English Works* (3 vols., 1901–02).

**Gown**, the long robe worn by women. In the fourteenth century gowns were common to both sexes alike. Gowns, frequently indicating by their color the rank of a student were retained by the universities as a badge, after the general mass of the people had ceased to wear such garments. After the Reformation, clerics who were not university graduates, and for greater distinction from Roman Catholic priests, adopted the black Geneva gown. In the United States the academic gowns are black, either of silk or worsted, and are similar, generally speaking, to those of Great Britain. See **DEGREE**.

**Gowrie Conspiracy**, the name given to one of the most singular episodes in the history of Scotland. The story runs that being induced by Alexander Ruthven to pay a visit to Perth in August, 1600, he was there received by Ruthven's brother, the Earl of Gowrie, in such a manner as to make it appear that the visit was wholly unexpected. After dinner Ruthven led James to a small study, where he attempted to kill him. The

*Governors of the States and Territories of the United States*

STATE	CAPITAL	GOVERNOR (Political Party)	YEARS
Alabama.....	Montgomery	Chauncey M. Sparks, D	4
Alaska.....	Juneau	Ernest H. Gruening, D	4
Arizona.....	Phoenix	Sidney P. Osborn, D	2
Arkansas.....	Little Rock	Ben Laney, D	2
California.....	Sacramento	Earl Warren, R	4
Colorado.....	Denver	John C. Vivian, R	2
Connecticut.....	Hartford	Raymond E. Baldwin, R	2
Delaware.....	Dover	Walter W. Bacon, R	4
Florida.....	Tallahassee	Millard Caldwell, D	4
Georgia.....	Atlanta	Ellis Arnall, D	2
Hawaii.....	Honolulu	Ingram M. Stainback	4
Idaho.....	Boise	Charles C. Gossett, D	2
Illinois.....	Springfield	Dwight H. Green, R	4
Indiana.....	Indianapolis	Ralph F. Yates, R	4
Iowa.....	Des Moines	Robert D. Blue, R	2
Kansas.....	Topeka	Andrew Schoeppel, R	2
Kentucky.....	Frankfort	Simeon S. Willis, R	4
Louisiana.....	Baton Rouge	J. H. Davis, D	4
Maine.....	Augusta	Horace A. Hildreth, R	2
Maryland.....	Annapolis	Herbert R. O'Connor, D	4
Massachusetts.....	Boston	Maurice J. Tobin, D	2
Michigan.....	Lansing	Harry F. Kelly, R	2
Minnesota.....	St. Paul	Edward J. Thye, R	2
Mississippi.....	Jackson	Thomas L. Bailey, D	4
Missouri.....	Jefferson City	Phil M. Donnelly, D	4
Montana.....	Helena	Sam C. Ford, R	4
Nebraska.....	Lincoln	Dwight Griswold, R	2
Nevada.....	Carson City	Vail Pittman, D	4
New Hampshire.....	Concord	Charles M. Dale, R	2
New Jersey.....	Trenton	Walter E. Edge, R	3
New Mexico.....	Santa Fé	John J. Dempsey, D	2
New York.....	Albany	Thomas E. Dewey, R	4
North Carolina.....	Raleigh	R. Gregg Cherry, D	4
North Dakota.....	Bismarck	Fred G. Aandahl, R	2
Ohio.....	Columbus	Frank J. Lausche, D	2
Oklahoma.....	Oklahoma City	Robert S. Kerr, D	4
Oregon.....	Salem	Earl Snell, R	4
Pennsylvania.....	Harrisburg	Edward Martin, R	4
Puerto Rico.....	San Juan	Rexford Guy Tugwell	..
Rhode Island.....	Providence	J. H. McGrath, D	2
South Carolina.....	Columbia	Olin D. Johnston, D	4
South Dakota.....	Pierre	M. Q. Sharpe, R	2
Tennessee.....	Nashville	J. Nance McCord, D	2
Texas.....	Austin	Coke R. Stevenson, D	2
Utah.....	Salt Lake City	Herbert B. Maw, D	4
Vermont.....	Montpelier	M. R. Proctor, R	2
Virginia.....	Richmond	Colgate W. Darden, Jr., D	4
Virgin Islands.....	Charlotte Amalie	Charles Harwood	..
Washington.....	Olympia	Mon C. Wallgren, D	4
West Virginia.....	Charleston	C. W. Meadows, D	4
Wisconsin.....	Madison	Walter S. Goodland, R	2
Wyoming.....	Cheyenne	Lester C. Hunt, D	4

King's cries for help were heard by Lennox, Mar, and the other attendants, who forced an entrance. A short encounter ended with the death of Gowrie and Ruthven, after which James returned to Falkland. On the authority of the King's declaration, Gowrie and Ruthven, whose dead bodies were produced at the bar, were declared traitors, and three of their servants were hanged. From the very first the story of the conspiracy was received with incredulity by many in Scotland and England. Consult L. A. Barbe's *Tragedy of Gowrie House*, A. Lang's *James VI. and the Gowrie Conspiracy*.

**Goya y Lucientes, Francisco José de** (1746-1828), Spanish painter, was born in Fuendetodos, near Saragossa. He was appointed painter-in-ordinary to Charles IV. and to his successor, Ferdinand VII., 1789. Among his sitters was the Duke of Wellington. Goya's genius does not find its best expression in his sacred paintings, but in his keenly characterized portraits, and still more in his paintings, sketches, drawings, and etchings of bull fights, of street fights, and his satirical studies of society and the church. Among his paintings are: *The Picnic*, *The Bewitched*, *La Maya*, and *Jewess of Tangier*. Consult Yriarte's *Goya*; Calvert's *Goya, His Life and Works* (1908).

**Goyaz**, the central state of Brazil, between Minas Geraes and Bahia on the e., and Matto Grosso on the w. The country is mountainous, being traversed by several well-wooded ranges. Agriculture and cattle grazing are the chief occupations of the inhabitants; p. 712, 210.

**Goyaz, Villa Boa de**, the capital of Goyaz state, Brazil, is situated on the Vermelho, a tributary of the Araguay. It preserves in its cathedral and large government buildings traces of better days; p. 25,000.

**Gozan**, the Guzanu of the cuneiform inscriptions, the Mygdonius of the Greeks, and the Hermas of Arabic writers, a river of Mesopotamia, and a sub-tributary of the Euphrates through the Khabur. It was to this region that the children of Israel were deported after the capture of Samaria in 722 B.C.

**Gozo**, British island, Mediterranean Sea. It possesses cyclopean walls of unknown origin, and Roman monuments. The history of Gozo is identical with that of Malta; p. 25,000.

**Gozzi, Count Gasparo** (1713-86), Italian poet and essayist, was born in Venice. He edited the journals *Gazzetta Veneta*, 1760, and *Osservatore Veneto*, 1761—the latter

modelled upon the English *Spectator*. Among his other works are *Il Mondo Morale* (1760), a collection of short papers, and *Lettere Famigliari* (1755 and 1808). Among his poems, the Horatian *Sermoni* and *Il Trionfo dell' Umiltà* are the most notable. Consult *Lives*, in Italian, by Malmiquati and Vimercati.

**Graaf, Regnier de** (1641-73), Dutch physician and anatomist, was born in Shoonhoven. At an early age he became widely known through his Latin *Treatise on the Nature and Use of the Pancreas* (1663). In 1672 he discovered the follicles of the ovaries, which have since been known by his name.

**Graaf Reinnet**, town, Cape of Good Hope, one of the oldest settlements of the Dutch East India Company. It has fine gardens and orchards, and is called the 'Gem of the Karroo'; p. 10,000.

**Gracchus**, a famous Roman family of the plebeian Sempronian clan. (1.) Tiberius Sempronius Gracchus, consul in 215 B.C., fought against the Carthaginians in the second Punic War. (2.) Tiberius Sempronius Gracchus, father of the tribunes, was born about 210 B.C. In 181 he was prætor, and governed the province of Spain for two years. In 177 he was consul, and suppressed a revolt in Sardinia; he was censor in 169, and consul again in 163. (3.) Tiberius Sempronius Gracchus (c. 167-133 B.C.), the elder son of the above. In 137 B.C. he served as quæstor under Mancinus in Spain, and was elected tribune for 133 B.C. He immediately attempted agrarian reform. The aim of his legislation was simply to redistribute the lands occupied by the nobles beyond what was allowed by the Licinian law. This unusual if not unconstitutional act gave his enemies a weapon against Tiberius; and a riot ensued, in which Gracchus was murdered. (4.) Caius Sempronius Gracchus (158-121 B.C.) was quæstor in Sardinia in 126 and 125 B.C. He was elected tribune for 123, and re-elected for 122. He re-enacted his brother's agrarian law; proposed to found several colonies, particularly at Carthage and Corinth; arranged that corn should be sold to the populace at a moderate price; caused the juries in public cases to be chosen from men possessed of the equestrian census, instead of from senators, thus creating the order of knights as a counterpoise to the senate; and re-enacted the law of appeal, which declared the indefeasible right of the Roman people to try capital cases, and indirectly condemned the senate for the murder of his

brother Tiberius and his partisans. These laws were carried while Caius was absent for a time in Africa superintending the foundation of the colony Junonia at Carthage. On his return he found his popularity gone, and he failed to be re-elected to the tribunate. Thereupon a riot arose, and Caius was driven to cast himself on the sword of one of his slaves. Consult Beesly's *Gracchi*; C. W. C. Oman's *Seven Roman Statesmen: the Gracchi*.

**Grace**, as a theological term, may be defined as the divine love in its special relationship to fallen mankind—the free and unearned favor of God toward sinners.

**Grace, William Gilbert** (1848-1915), English cricketer, was born in Downend, near Bristol. He was by far the foremost of cricketers, playing in the great matches at home, in Canada, the United States, and Australia. Consult his *Cricketing Reminiscences* (1899); *W. G.'s Little Book* (1909).

**Grace, William Russell** (1832-1904), American merchant, was born in Queens-town, Cork, Ireland. He established the firm of W. R. Grace & Co., 1865, for the South and Central American trade, and founded the New York and Pacific Steamship Company, 1891. He was twice mayor of New York City, 1881-2 and 1885-6.

**Grace, Days of.** See **Days of Grace**.

**Grace Notes**, in vocal or instrumental music, are not essential to the theme, but are introduced by way of ornament. They are not counted in the time allowed for a measure; the time required for their performance must therefore be deducted from that allowed for the other notes.

**Graces.** See **Charities**.

**Grackle.** See **Grakle**.

**Gradient**, a term used chiefly in connection with railroads to signify a departure of the line from a perfect level. It is expressed by stating either the horizontal distance in which the change of level amounts to 1 ft., or the amount of change that would occur in some selected distance, such as 1 mile or 100 ft.

**Gradisca.** See **Görz and Gradisca**.

**Grado**, ancient town and modern fishing station, province Görz and Gradisca, Austria, at the northern extremity of the Adriatic. In the sixth and seventh centuries it was the residence of the patriarch of Aquileia; p. 4,718.

**Gradual**, a kind of short anthem sung at high mass after the epistle. The words of the gradual are usually taken from the Psalms,

and its use dates from about the fifth century.

**Gradual Psalms, Songs of Ascents, or Songs of Degrees**, a group of fifteen short but exquisite lyrics in the Hebrew Psalter. In the Roman Catholic Church they are recited on the Wednesdays in Lent, except the last.

**Graduation.** By the term graduation is meant those processes by which linear scales and circles, or circular arcs, are accurately divided into any required number of equal parts. Such methods are constantly employed in the division of the scales of instruments used for precision of measurement. It is obvious that all methods of graduation must depend upon some primary or original graduation. The subject may therefore be considered first in reference to *original* graduation; and afterward the reproduction from originally graduated lines or arcs may be dealt with. The primary process in original graduation is the operation of dividing a line into a given number of equal parts.

Let AB be a line: it is required to divide it into, say, seven equal parts. From A draw AC, making any convenient angle with AB, and on AC lay off with compasses or a scale seven equal distances from A. Join BD, supposing D to be at the end of the seventh part on AC, and through the other points of division of AC draw lines parallel to BC. These will cut AB into seven equal parts.

In another method, that known as *continual bisection*, the length of half the line is found, by means of the beam compass, with arcs described from both ends. Each half of the line is, by the same means, halved again, and so on until the required number of divisions is obtained. Similar divisions of a straight line may be obtained by laying off, by a pair of spring dividers, one after another, from one end of the line, the smallest part required. This method is known as *stepping*. The most favored method by which circles are divided depends upon the principle of bisection in use in linear graduation. Since the chord of an arc of 60° is equal to the radius of the circle, if this length be laid off from any point on the circle, an angle of 60° is thereby determined. The half of this angle added to 60° forms the quadrant, or 90°. Continual bisection of 60° gives the smaller divisions of degrees and fractions of a degree. The reproduction, or *copying* as it is termed, or 'original' graduated straight scales, circles, or circular arcs, may be done

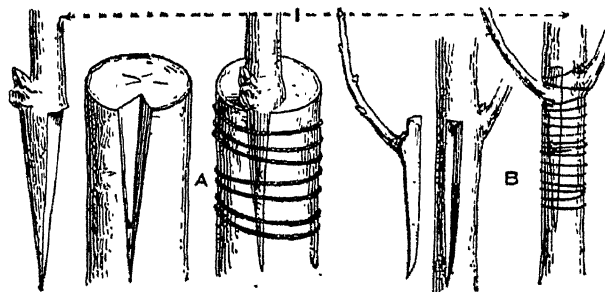
either by hand or by mechanical contrivances.

**Gradus ad Parnassum**, a dictionary of Latin prosody, giving the quantities of words and suggesting synonyms, poetical phrases, and epithets.

**Grady, Henry Woodfin** (1851-89), American orator and journalist, was born in Athens, Ga. He was widely known as the exponent of the friendly feelings expressed toward the North by the younger generation of the South. His articles on the condition of the South, published in *The Constitution* and elsewhere, attracted universal attention, and his speech, 'The New South,' before the New England Society, 1886, was quoted everywhere. Consult *Harris' Life and Speeches*; *Lee's Life*.

The rooted plant which is to receive the graft is called the 'stock'; the cutting which is to be applied to the stock, and to obtain its nourishment from it, is called the 'scion.' The object of grafting is usually to utilize the age and strength of a cheap, or easily obtainable, or exceptionally vigorous stock in order to obtain quickly the fruits or flowers produced by the plant whence the grafts were cut. The methods of grafting are very various; thus we have grafting by inlaying, by veneering, by in-arching, side-grafting, crown-grafting, whip-grafting, cleft-grafting, and saddle-grafting.

**Graham.** The Scottish family is of Anglo-Norman origin, but has for eight centuries been settled in Scotland, holding lands granted to William de Graham by David I.



GRAFTING: A, Crown; B, Side.

**Graf, Anton** (1736-1813), German painter.

**Gräfe, Albrecht von** (1828-70), German oculist and physician, was born in Berlin. He founded there, 1850, a private institution for the cure of ocular disease. He successfully combated glaucoma, before regarded as incurable, and developed an improved method of operating for cataract. An authority upon diseases of the brain and nervous system, he was the first to diagnose their state from their morbid effect upon the eye.

**Gräfe, Karl Ferdinand von** (1787-1840), German surgeon, born in Warsaw, who improved methods and appliances of surgical operation. See *Life* by Michaelis.

**Graf Spee**, German pocket battleship. Attacked Dec. 10, 1914 by 3 Brit. cruisers off the coast of Peru, it sought refuge in Montevideo Harbor. Rather than be taken, its captain sank his ship and committed suicide.

**Grafting**, the process of placing together two cut surfaces of different plants so that they shall unite and become an organic unity.

**Graham, Charles Kinnard** (1824-89), American civil engineer, was born in New York city. In 1857 he was appointed constructing engineer at the Brooklyn Navy Yard. Here he designed and built the first dry docks and landings. In 1861 he joined the Union army and rose to the rank of general. From 1873 to 1875 he was chief engineer of the Dock Department in New York, and surveyor of the port of New York, 1878-83.

**Graham, James Duncan** (1795-1865), American soldier and engineer, born in Virginia. In 1840-43 he was commissioner for the survey of the northeast boundary of the United States along the New York and Maine frontiers. From 1843 until the end of the Mexican War, Major Graham was employed as astronomer to the commission appointed by the government to define the boundary between the United States and Canada. In 1850 he was detailed to make a thorough survey of Mason and Dixon's line. In 1851 he was astronomer to the Mexican boundary



survey, and in 1864 he was placed in charge of engineering works connected with the improvement of harbors along the Atlantic coast. At the time of his death he had charge of the improvements being carried out in Boston harbor. His chief work was a voluminous report on his survey of Mason and Dixon's line, issued in 1850.

**Graham, Thomas** (1805-69), Scottish chemist, was born at Glasgow. His researches on the molecular movements of gases and liquids are classical; he enunciated the law of gaseous diffusion, known as 'Graham's law'; classified bodies into crystalloids and colloids; studied phosphates, and the diffusion of liquids. To him we owe the introduction of bronze coinage. He published *The Elements of Chemistry* (1842). See R. Angus Smith's *Life and Works of T. Graham* (1884).

**Graham, William Alexander** (1804-75), American politician, was born in Lincoln co., N. C. He was in the U. S. Senate in 1840-43, and was elected governor of the state by large Whig majorities two terms, and declined a third. He was secretary of the navy in President Fillmore's cabinet, and organized Commodore Perry's expedition to Japan.

**Graham Land**, tract of land S. Antarctic Ocean, roughly included between 56° and 57° w., and 65° and 60° s.

**Graham-White, Claude** (1879- ), English aviator, owned one of the original gas-driven automobiles. In 1909 he secured an aviator's certificate and in 1910 won the Bennett Cup. He founded the first British flying school and entered a company to run the airdrome at Hendon.

**Grahame, Kenneth** (1859-1931), author of *The Golden Age* and *Dream Days*, was a popular writer of children's books.

**Grail, Holy**, the vessel (cup or dish) of the Last Supper, which, according to tradition, was subsequently used by Joseph of Arimathea to collect the blood which flowed from the wounds of Christ upon the cross, and was ultimately brought by Joseph or his descendants to the British Isles. The romances represent the Grail as in the charge of a king of Joseph's race, known as the Fisher King, or Rich Fisher. His successor is to prove his fitness for the office by asking a mysterious question. But the future Grail-winner is unaware of his high destiny, and ignorant of the Grail; thus he fails to put the question, and so involves the land of Britain in mysterious enchantments which only cease when the question is satisfactorily put. This story,

originally independent of the Arthurian cycle, eventually became incorporated with it, and the Grail quest, at first the task of a single predestined hero, became the final and crowning adventure in which all the knights of the Round Table took part. The origin of the story has been variously stated to be a Christian tradition, an Oriental legend, and a Celtic folk-tale; and the credit of inventing the whole story has been ascribed respectively to Walter Map, Chrétien de Troyes and Robert de Borron.

**Grain**, a unit of weight, originally determined by the average weight of a full grain of wheat. It is now 1-7000th of a pound avoirdupois. See WEIGHTS AND MEASURES.

**Grainger, Percy Aldridge** (1882- ), Australian pianist and composer, studied with Kwast and Busoni; came to the U. S. in 1914; composed pieces based on folk tunes.

**Grain Elevator**. See **Elevators**.

**Grains of Paradise**, the seeds of two African plants, *Anomum grana paradisi* and *A. melegueta*, belonging to the order Scitamineæ. They are aromatic plants allied to the cardamon, and were formerly much used in embalming. The seeds are sometimes known as Guinea grains or Melegueta pepper, and are used in some countries as a condiment.

**Graklos**, or **Grackles**, are passerine birds related to starlings (Sturnidæ), but more arboreal in their habits. In America the name is given to the large blackbirds of the genus *Quiscalus*, which form vast flocks during the autumn migration, and in spring are so much a pest to the cultivator of Indian corn.

**Gram**, the unit of weight in the metric system. It is the one-thousandth part of the international standard platinum-iridium prototype kilogram, and is almost the thousandth part of the weight of a liter of distilled water at 4° c. In other words, it is the weight of a cubic centimeter of distilled water at this temperature.

**Gramineæ**, the order of plants containing all the grasses (including bamboos), and constituting the most important order of the vegetable kingdom. See GRASSES.

**Grammar**, a science that treats of the principles which explain the correct use of language, either oral or written. Grammar finds its rules in the current practices of the community; its authority is merely that of a guide to what is customary. As every language constantly changes, so does its grammar. There is no criterion by which the forms of a certain period can be settled and made the standard for all time to come. The

prevailing linguistic usages of a community or class constitute the grammar of its language or form of speech; their orderly investigation and statement is the science of grammar. The task of determining the general usages which are the subject of grammar is not altogether a simple one. The grammarian may prefer the usage of those who employ habitually nothing but the common language, and of those who move constantly in circles where it is so employed (at court, in the universities, on the stage). But even then variations remain. There are always transition periods in which the old and the new exist side by side. In such cases, and in others also, the scientific grammarian has no choice but to recognize more than one usage as grammatical.

In the usages of the common language there is regularly a difference between the literary and the colloquial forms. A comprehensive standard grammar should include both. In the acquisition of a language it is invariably best, when possible, to secure a knowledge of the colloquial forms first. The more the spoken language differs from the written, the more advisable is it to follow this order of acquisition. Recent grammarians generally include in their treatment of their subject some account of the history of the sounds, forms, and constructions of the language with which they deal. This procedure has many advantages. The 'irregularities' of the old grammars disappear; the forms and idioms of the language are made intelligible; it becomes clear that the grammar of one period is not that of another, and that standard forms are simply those of a particular date. Grammar deals with three classes of facts, and therefore has three divisions—phonology, morphology, and syntax. Phonology treats of the sounds of a language, and also of the written symbols which may be employed to represent these sounds. Morphology treats of the structure of words, and of their inflections. Syntax treats of the proper use of word forms, and of the customary arrangement of sentences. It is usual to speak of grammatical forms and constructions, but not of grammatical pronunciations. But the expression 'standard pronunciation' conveys the same meaning, and an exposition of the sound system of a language is an essential part of grammar.

The grammarian's first duty is to enumerate and describe the constituent sounds of the language with which he has to deal. To accomplish this scientifically, he must be

equipped with a knowledge of phonetics. The only satisfactory way of identifying sounds is to state the manner of their formation. The grammarian investigates and explains by what means and with what success the language he treats of is expressed in writing. He gives an account of the forms and values of its written symbols. As an introduction to morphology, phonology should include some account of the phonetic changes which accompany word composition and inflection.

Morphology of grammar includes (a) a classification and analysis of word stems; (b) a similar treatment of inflections. The first division is closely related to etymology, and the second has been termed accidence. (a) Words which are logically of the same class tend to assume similar forms linguistically. The 'parts of speech,' for instance, are distinguished to a large extent by their acquisition of forms special to each. There are also distinctive types of verbs and nouns which coincide with differences of meaning or inflection. So far as words of a distinctive phonetic type are bases for special modes of inflection, or possess a distinctive meaning, they are a subject for grammatical treatment. Types with a distinctive meaning are formed by reduplication and in other ways, but principally by word composition. Groups with a common meaning are then constituted by the presence of common prefixes and suffixes. The personal endings of prefixes of verbs are often clearly personal pronouns. (b) Inflection is the variation of which words are capable in virtue of their belonging to one of the classes known as the parts of speech. Verbs, nouns, and adjectives show most susceptibility to inflection. Inflected forms either express relation to other words, as case, or define some psychological element contained in the meaning of the word—gender, number, tense. Languages vary greatly in the extent and character of their inflections. The Semitic languages have no verb forms to indicate differences of time. Other languages are said to be altogether destitute of inflections. It may be supposed that the oldest languages were at one time uninflected.

The name syntax is most appropriate to that part of grammar which treats of the arrangement of sentences; but it also investigates and explains the use made of inflectional forms within a sentence. It treats of the manner in which words are combined to express thought. A sentence in its simplest

form is an expression of relation between ideas. Tone and gesture are indications of meaning which are lost in written speech. What is left is the arrangement of words and their inflections. Such relations as are expressed by the terms 'subject,' 'predicate,' and 'object' find expression in a particular order of words; adjectives which are attributes are distinguished by their position from those which are predicates, and so on. When a language possesses a highly-developed inflectional system, it is less bound to a rigid sentence order, as in Latin poetry. In the use of inflections, a notable feature is the endeavor to establish concord, as between adjective and noun, verb and subject. This effort supplies adjectives with a whole set of inflections. It involves also conflicts between the demands of grammatical concord and the older practice, or the psychological conceptions of the community—in the treatment of collectives as singulars or plurals.

The differentiation of types or sentences supplies a large amount of material to syntax. Interrogative, optative, and many other kinds of sentences come to be distinguished by their special arrangement and the employment of special forms. Tested logically, the division into parts of speech is found to rest on a very imperfect analysis; and, besides, some of the parts of speech are constituted by the discharge of functions which do not exist in every stage of the development of language: for example, prepositions, conjunctions, and adverbs are not primary or necessary elements of speech. The 'parts of speech' are merely an enumeration of the principal word classes of Greek and Latin grammar. See, further, PARTS OF SPEECH.

**Gramont, Philibert, Comte de** (1621-1707), a French courtier of Louis XIV. of France, and subsequently of Charles II. of England. The celebrated *Mémoires* of Gramont were probably from the pen of his wife's brother, Count Anthony Hamilton, although revised by Gramont. A brilliant picture of the court life and of some of the leading characters of the age, it is also valued for its literary merit. Among the best English editions are Bohn's (1846) and Nimmo's (1889).

**Gramophone.** See **Phonograph**.

**Grampians.** (1.) Mountain system, Scotland, separating the Lowlands from the Highlands. The principal heights are Ben Nevis (4,406 ft.), Ben Cruachan, Ben Macdhui, Cairngorm, Schiehallion, and Cairntoul. (2.) Mountain range Victoria, Australia.

The principal peak is Mount William (3,827 ft.).

**Grampus,** any of several small whales or cetaceans.

**Granada.** (1.) Political subdivision of the republic of Spain. The *vega* (plain) of Granada is famous throughout Spain for its beauty and luxuriance; p. 542,640. It was from the 13th to the end of the 15th century the seat of a Moorish kingdom, formed after the collapse (1236) of the caliphate of Cordova. (2.) City, chief tn. of above prov., is an ancient Moorish city, seat of the last Moslem kings, and was conquered by Ferdinand and Isabella in 1492. Beautifully placed (alt. 2,200 ft.) on the slope of the Sierra Nevada, it enjoys a delightful climate, and possesses the famous palace of the Alhambra, and other picturesque structures of Moorish character. It is the seat of an archbishop, and has a university and a richly-decorated renaissance cathedral (1529) containing the tombs of Ferdinand and Isabella, Philip I and his consort Juana. In the church of San Jerónimo is the cenotaph of Gonsalvo de Cordova. Liquors, textiles, paper, and soap are manufactured; p. 109,000. (3.) Town, cap. of prov. of same name, Nicaragua, Central America; p. 25,000.

**Granadilla.** See **Passion-Flower**.

**Gran Chaco,** El, dist. of S. America, comprising parts of S.E. Bolivia, S.W. Brazil, W. Paraguay, and N. Argentina, with an area of over 200,000 sq. m.

**Grand, Sarah,** pen-name of **Frances Elizabeth M'Fall** (1862-1943), Eng. novelist, was born in Ireland. She established her reputation by her first novel, *Ideala* (1888). Her other works are *The Heavenly Twins* (1893); *Our Manifold Nature* (1894); *The Beth Book* (1897); *Babs the Impossible* (1901).

**Grand Army of the Republic,** a patriotic society with headquarters at Washington, D. C., organized in 1866, when the first post was organized at Decatur, Ill. Membership is limited to persons who served during the Civil War in the United States army, navy or marine corps, or in state regiments in active service under United States general officers. Members are entitled to wear a distinctive uniform on official occasions. The badge is a brass star.

**Grand Bank,** Submarine plateau of some 500,000 sq. m., with a depth of from 10 to 160 fathoms, extending southeast from the coast of Newfoundland. The banks swarm with codfish, and the fishery occupies some

100,000 fishermen (British, American, and French).

**Grand Canal of China** (Chinese, *Chah-ho*, 'river of flood gates,' or *Yün-ho*, 'transport river'), extends from Hangchow n. to Tientsin, a distance of about 650 miles. It was a part of the system of 1,600 leagues of improved waterways developed by Yangti (605-618) of the Sui dynasty. The Grand Canal is in some places 20 ft. above the country it traverses, and in others 70 ft. below. At the time of its construction it was the greatest engineering work of its kind in the world. It fell into disuse when traffic by the sea route with steam vessels became cheaper and speedier.

**Grand Canal of Venice**, the main waterway of Venice, Italy, winding through the heart of the city in the shape of an S. Many noted palaces front on the Canal; and it is crossed by the famous Rialto bridge, a single marble arch of quaint beauty. It is about 2 miles long, and varies from 100 to 200 ft. in width.

**Grand Canary Island, or Gran Canaria**, the central island of the Canary group. About 65,000 tourists visit the island annually. Area, 523 sq. m.; p. 130,000.

**Grand Canyon of the Colorado**, properly that section of the great gorge of the Colorado River extending from the mouth of the Little Colorado River, past the fantastically spired ridge known as Powell's Plateau, and the Grand Wash to the many-templed Canyon of the Rio Virgen—a distance of about 218 miles. The width of the Canyon varies from 10 to 40 miles. The depth of the Canyon is about 3,000 ft. to the plateau below the 'rim,' and through this the Colorado River winds in a narrow granite gorge, 1,400 ft. deep, and about 3,500 ft. wide at the top. Above the plateau the strata lie in bands of contrasting colors—greenish shales, blue and creamy limestones with red stainings, and sandstones of white and buff and every shade of red from brick to brown—weathered into castellated pyramids and mounds, towers, turrets, and spires, grotesque in form and titanic in proportions. In the walls of the Grand Canyon seven distinct series of rocks are exposed, from the gneiss of the Eozoic to the cherty limestone of the Palæozoic. Consult J. W. Powell's *Explorations of the Colorado River of the West*, and *Canyons of the Colorado*; C. Dutton's *Tertiary History of the Grand Canyon District*; L. R. Freeman *Down the Grand Canyon* (1924).

**Grand Coulee Dam**, in the State of Washington, was completed June 1942, to control flood waters of Columbia River; 4,300 ft. long, 300 ft. high; it forms a lake 151 miles to the Canadian border.

**Grandee**, the name of the highest rank of Spanish nobility.



Scene in the Grand Canyon, Colorado.

**Grand Falls**, cataracts on Grand or Hamilton River, Labrador, Canada, with a total descent of 2,000 ft., and comprising two falls of over 300 ft. each.

**Grand Forks**, City, North Dakota. It is the seat of the University of North Dakota. Other educational institutions are Grand Forks College, Wesley College, and St. Bernard Academy; p. 20,228.

**Grand Manan Island** lies off the coast of New Brunswick, in the Bay of Fundy. The scenery is picturesque, and the island is a favorite resort for tourists and invalids; p. 2,540.

**Grandmontines, or Grandmontains**, a religious order founded in Auvergne, France, in 1077, by St. Stephen of Thiers, who, while visiting Italy, became so impressed with the hermits of Calabria that he desired to introduce their habits of life into France. Shortly

before the French Revolution it ceased to exist.

**Grand National**, the most important steeplechase race in England, is run at Aintree, near Liverpool.

**Grand Pré**, now **Horton**, village, King's co., Nova Scotia. It is situated in one of the most beautiful and fertile sections of Nova Scotia, and has extensive facilities for the packing and shipping of fruit. It is the scene of Longfellow's *Evangeline*, and has many relics of the French Acadians; p. 4397.

**Grand Prix de Paris**, an international race run at Longchamps, France. The course is 1 mile 7 furlongs in length, and the stake is the most valuable in Europe, amounting to more than 250,000 francs.

test against misgovernment and a petition for reforms, adopted by the English Parliament on Nov. 22, 1641, and presented to Charles I. on Dec. 1 by a deputation of its members. The King treated the Remonstrance with scant consideration, and on Jan. 3, 1642, ordered the impeachment of the members of Parliament who had secured its passage. See *ENGLAND, History*.

**Grand River**, or **Hamilton**, or **Ashuanipi**, Labrador, rises in Ashuanipi Lake, in the Labrador Mountains, and flows southward through fine but rugged scenery and chasms whose walls are 500 ft. high. During its course it passes over the Grand Falls of Labrador, more than 300 ft. high, beyond which for several miles are dangerous rapids.



*A Granite Quarry.*

**Grand Prix de Rome**. See *Rome, Prix de*.

**Grand Rapids**, city, Michigan. It was one of the first cities in the United States to include vocational guidance in the public school system. Grand Rapids is the second manufacturing city in the State, and is world-famous for its furniture and allied industries. Originally an Indian village, an Indian mission was established here in 1824, a trading post in 1826, and the first permanent settlement by the Dexter Colony (from New York State) in 1833, when the first saw-mill was built. Incorporated as Kent in 1838 and its name changed to Grand Rapids in 1842, it was made a city in 1850. It is the second largest city in Michigan; p. 164,061.

**Grand Remonstrance**, a document, largely the work of John Pym, combining a pro-

**Grand Sergeanty**, an honorable tenure of lands under the feudal system, by which lands or tenements were held directly from the king in return for personal services rendered.

**Grandson**, or **Granson**, small town, with a fine old castle, in the Swiss canton of Vaud, near the southwest extremity of the Lake of Neuchâtel. It was the scene of the defeat (March 2, 1476) of Charles the Bold, duke of Burgundy, by the Swiss; p. 1,900.

**Grand Teton National Park**, a tract of 150 acres in northwestern Wyoming, about 11 miles s. of Yellowstone National Park, was set apart by act of Congress in 1929. The highest point is Grand Teton (13,747 ft.). Glaciers remain in the mountain folds and glassy lakes reflect the mountains in their depths. The 'gateway' is Victor, Idaho.

**Grandville**, pseudonym of Jean Ignace

**Isadore Gérard** (1803-47), French caricaturist, born in Nancy. His illustrations to *La Fontaine's Fables*, *Gulliver's Travels*, *Don Quixote*, and other works were as successful as his political caricatures.

**Granet, François Marius** (1775-1849), French painter, was born in Aix in Provence and studied under Constantin and David. He went to Paris in 1797 and there spent his time in the convent of the Capuchins, where he obtained the background for his celebrated work, the *Chœur des Capucins* (1811). His fortune and the greater part of his art treasures went, at his death, to establish a museum in his native city. His principal works include *Stella Painting a Madonna on his Prison Wall* (1810); *Sodoma à l'hôpital* (1815); *Basilique, basse de St. François d'Assise* (1823); *Rachat de prisonniers* (1830); and the *Mort de Poussin* (1934).

**Grange, The**, popular name for the PATRONS OF HUSBANDRY, the farmer's fraternal organization, founded in 1867 to promote the interests of the agricultural class of the United States. The order was chartered at Washington on Dec. 4, 1867, by O. H. Kelley, William Saunders, and five others. The purposes of the Grange are to promote social and business fellowship among those interested in farming; to introduce co-operation in buying and selling; and to disseminate the best information relative to crops, methods of cultivation, prices, and markets. The order is secret, with a simple ritual. It is for both sexes, and young people as well as adults are included in the membership. Its organization consists of four bodies—the National Grange, composed of the masters of the State granges, their wives, and all seventh degree members; the State grange, consisting of delegates from the local granges and all sixth degree members; Pomona or district granges, composed of all fifth degree members; and the local or subordinate granges.

The National and State granges meet annually; the local granges meet monthly or at more frequent intervals. Membership in the latter is confined to persons actually engaged in agriculture, or whose greatest source of income is derived from agricultural pursuits; membership in the State and national granges is by election from the local granges. During the earlier years of its existence, the Grange was influential in securing legislation favorable to the farmer, especially in the direction of railway rate regulation. In Iowa in 1874 the Grange was responsible for the first law that undertook systematically to control rail-

way rates. The Hatch Agricultural Experiment Stations are to be credited to the Grange; also the elevation of the Bureau of Agriculture to the rank of a Department, with a Cabinet member at its head. The Grange has made itself felt in the development of many State agricultural colleges; while country fairs and festivals innumerable bear testimony to its activity. It maintains headquarters in Washington, D. C., where it is a more conservative farmers' organization influencing legislation. Consult T. C. Atkinson, *Outlines of Grange History* (1928); and *Semi-Centennial History of the Patrons of Husbandry* (1916); *Proceedings of the National Grange*.

**Granger, James** (c. 1723-76), English biographer, was born in Shaston, Dorsetshire. His *Biographical History of England from Egbert to the Revolution* (1769) was one of the first works of the kind into which portraits of the subjects were introduced.

**Granicus**, the ancient name of a small river of Asia Minor, now known as the Kodsha-su. It was famous for Alexander the Great's victory over the Persians in 334 B.C.; also for a victory of Lucullus over Mithridates in 73 B.C.

**Granite** (Italian *granito*, 'gritty'; Latin *granum*, 'grain'), a well-known family of crystal line-granular rocks, composed principally of quartz, feldspar, and mica. Granites are usually red, pink, or gray, depending on the color of the feldspars. If hornblende or black mica is abundant the rock may be dark green or almost black.

Granites are igneous rocks, crystallized and coarse-grained, and therefore must have solidified deep below the surface under high temperature and pressure, where the constituent minerals crystallized out slowly, the crystals interlocking with one another. Granite usually occurs in great bosses or amorphous masses, and frequently forms the nuclei of mountain chains. Granites are of massive homogeneous texture and are classified as fine, medium and coarse-grained. In the United States granites occur in four chief areas, the Appalachian district from Maine to Georgia, the Middle Western States, particularly Minnesota and Wisconsin, the Rocky Mountain States, and the Pacific Coast States, particularly California. The granite from Vermont, Massachusetts and Minnesota is principally monumental and architectural building stone, that from Carolina and Virginia, crushed stone. The leading centers of production of monumental

granite are Quincy, Mass., Barre, Vt., and St. Cloud, Minn. Consult International Circular No. 6268 of the U. S. Bureau of Mines (1930); Report of Investigations No. 3065 (1931).

**Granite State**, a popular name for New Hampshire.

**Gran Sasso d'Italia** ('Great Rock of Italy'), also called MONTE CORNO, is situated on the borders of the Abruzzi, between Teramo and Aquila. It is the highest summit of the Apennines, having an elevation of 9,585 ft.

**Grant**, in law, signified originally a transfer of incorporeal rights relating to land, which on account of their nature could not properly be conveyed by feoffment with livery of seisin. In this case, delivery of the deed in which the grant was embodied had the same effect as the actual or symbolical delivery of corporeal property. Now, however, the latter also is conveyed by deed of grant, feoffment with livery of seisin being obsolete, both in England and in the United States. See DEED.

**Grant, Frederick Dent** (1850-1912), American soldier, eldest son of U. S. Grant, was born in St. Louis, Mo. He was with his father in the latter part of the Civil War, serving as voluntary aide and despatch bearer. In 1888 he became U. S. Minister to Austria; and from 1894 to 1898 served as a police commissioner of New York City. When the Spanish War began, Grant was appointed colonel of the Fourteenth New York Infantry (May 2, 1898), and three weeks later he became brigadier-general of U. S. volunteers.

**Grant, James Augustus** (1827-92), Scottish explorer, was born in Nairn. He accompanied Captain Speke to Africa, where they explored the sources of the Nile (1860-63). He published: *A Walk Across Africa; Botany of the Speke and Grant Expedition; Khartoum as I Saw It in 1863*.

**Grant, Robert** (1852-1941), Am. author, was born in Boston. Among his books are: *The Carletons* (1891); *The Bachelor's Christmas and Other Stories* (1895); *Unleavened Bread* (his best-known book, 1900); *The Chippendales* (1909); *The Art of Living* (1895); *The Bishop's Granddaughter* (1925); *The Dark Horse* (1931).

**Grant, Ulysses Simpson (Hiram)**, (1822-85), distinguished American soldier and eighteenth President of the United States, was born in Point Pleasant, Clermont co., Ohio, on April 27, 1822. Grant

served with distinction in the principal engagements of the Mexican War. He participated in the Battles of Palo Alto and Resaca de la Palma, and was also present at the capture of Monterey. Later the Fourth Infantry embarked for Vera Cruz, to join the army of Gen. Winfield Scott, and Grant took part in the battles of Scott's successful campaign and in the final capture of the City of Mexico. He won the brevets of first lieutenant and captain for gallant and meritorious conduct at Molino del Rey and Chapultepec; at Monterey he volunteered for hazardous duty; and he was thanked upon the field of Chapultepec by General Worth for his noteworthy service.

On Sept. 1, 1861, he was assigned to the command of a military district of South-eastern Missouri under Frémont. On assuming command he promptly seized Paducah, Ky., at the mouth of the Tennessee River, Sept. 6, 1861, and on Nov. 7th he advanced from Cairo with 3,114 men in transports, convoyed by two gunboats, and made a successful demonstration against Belmont, Mo., to prevent the Confederates at Columbus, Ky., from reinforcing Price's army in Missouri. At the beginning of Feb., 1862, Grant, seconded by a fleet of gunboats under Commodore Foote, advanced against Fort Henry and Fort Donelson, commanding respectively the Tennessee R. and the Cumberland. On Feb. 6th Fort Henry was taken by Commodore Foote. Ten days later, after a severe engagement had been fought, Grant received the surrender of Fort Donelson. This was the first great victory of the Federals in the war and it opened a way into the very heart of the Confederacy.

On April 6-7, 1862, he fought the battle at Shiloh. In immediate command of the right wing and reserve of Halleck's army he took part in the operations against Corinth, which was evacuated by the Confederates on May 29th. Halleck having been summoned to Washington in July as general-in-chief of all the armies of the United States, Grant assumed the conduct of the operations in this theatre of the war with his headquarters at first at Corinth. On Sept. 19th he defeated Gen. Price at Iuka. Grant was advanced to the command of the Department of the Tennessee, Oct. 16, 1862. In command of the army on the Mississippi, he began on Nov. 2, 1862, a movement against Vicksburg, Miss., which resulted in its capture, July 4, 1863, after a series of field engagements and a siege. After the battle of Chickamauga

Grant assumed command in person at Chattanooga and in the battle of Chattanooga, on Nov. 23-25, defeated Gen. Bragg. From this time until the end of the war Grant was given entire control of the armies of the United States, subject only to the authority of President Lincoln.

On May 5-6, 1864, was fought the battle of the Wilderness, followed by the engagements at Spottsylvania Court House. On June 3, Grant hurled his columns against Lee's army at Cold Harbor only to see them repulsed with terrific slaughter. He now deter-



*Ulysses S. Grant.*

mined to pave his way to Richmond by the capture of Petersburg. The most arduous siege operations ensued. On March 31-April 1, 1865, Lee suffered a severe reverse at the hands of Sheridan in the battle of Five Forks. Petersburg and Richmond had to be evacuated, and on April 9, 1865, Lee surrendered to Grant at Appomattox Court House. The result of the campaign of united action under Grant was the complete collapse of the Confederacy. The armies of Grant and Sherman were marched to Washington and disbanded, after a triumphal procession through the capital city. He accepted the nomination for the presidency bestowed upon him March 20, 1868, by the unanimous vote of the Republican convention on the first ballot. He was inaugurated March 4, 1869. On June 5, 1872, he was renominated

without opposition and in the ensuing election overwhelmingly defeated Horace Greeley.

To the credit of his two administrations stands the great work of establishing upon the sound basis of specie payment the finances of the country, demoralized by an enormous issue of irredeemable currency; the reduction of the public debt, and refunding the remainder at a lower rate of interest; the settlement of threatening disputes with Great Britain by the negotiation of the treaty of Washington, May 8, 1871; an agreement on the questions of the Canadian fisheries and the boundary dividing the United States on the northwest from Canada; the passage of an act recommended by Grant to secure a reform in the civil service; the adoption of the 15th Amendment to the Constitution of the United States on the urgent recommendation of Grant; the extension of the postal system of free delivery and the participation in the organization of the Universal Postal Union; and the negotiation of a commercial treaty with Mexico. Another treaty, negotiated with Italy, exempted private property from capture in war. At the close of his twelve years of arduous public service Grant sought recreation in a trip around the world, May 17, 1877-Nov. 12, 1879, during which he was received in all the countries he visited with honors only second to those bestowed upon royalty.

He quietly breathed his last on the morning of July 23, 1885. The entire country, his former foes as well as his friends, united in doing honor to his memory. A mausoleum on the banks of the Hudson in New York city, which can be seen far up and down the river, marks the resting-place of the great soldier, pacificator, and civil administrator. Consult *Personal Memoirs of U. S. Grant* (1885); *Wilson, Life and Public Services of U. S. Grant* (1886); *John Eaton Grant, Lincoln, and the Freedmen* (1907); *J. F. C. Fuller The Generalship of Ulysses S. Grant* (1929).

**Grantham**, mrkt. tn., munic. and parl. bor., Lincolnshire, England. The ancient church of St. Wulfran has a beautiful 14th century tower and spire 280 ft. high. At the Angel Inn Richard III. signed the death warrant of Buckingham (1483). The George Hotel, rebuilt in 1780, is described in *Nicholas Nickleby*. There is a bronze statue of Sir Isaac Newton (who was educated in the town) on St. Peter's Hill. In the vicinity Oliver Cromwell (1643) first defeated a royalist force; p. 17,593.



**Grants Pass**, city, Ore. The valley is very fertile, and the surrounding region, with the spurs of the Coast Range, offers great scenic attractions and unsurpassed hunting and fishing grounds; p. 60:8.

**Grant University**, a coeducational Methodist institution formed in 1889 by the affiliation of Chattanooga University (1886) and Grant Memorial University of Athens, Tenn. The name has since been changed to the University of Chattanooga.

**Granulation**, a process of healing involving the formation of small conical projections on the surface of an open wound or on the base of an ulcer during the process of repair.

**Granulite**, a metamorphic rock consisting essentially of quartz, feldspar, and garnet.

**Granville**, or **Granvella**, **Antoine Perrenot de** (1517-86), Spanish ecclesiastic and imperial statesman, the son of Charles v.'s imperial chancellor (1530-50), Nicholas Perrenot de Granville, was born in Besançon. When but twenty-three years of age, he became bishop of Arras (1540), and was henceforth the chief political agent of Charles v. against the patriotic leaders of the Netherlands and the entire Protestant movement.

**Grape**, the fruit of any of the many species of the genus *Vitis*, known in European countries as the Vine and in America as the Grape or Grape Vine. The original home of the grape seems to have been in Asia, but it is now found wild in Northern Africa, Southern Europe, and in North and South America. It was introduced into France and Italy presumably by the Phœnicians, and was taken to England by the Romans; the Dutch carried the plant to South Africa, and the Spanish took it to America. At the present time its cultivation for wine is carried on in Southern Europe — especially Italy, France, Spain, Portugal, and Southern Russia. The grape vine is a woody climbing vine supporting itself by strong branched tendrils, opposite or alternate. The leaves are deeply lobed and palmately veined, with a downy surface; the flowers are small and greenish white; the fruit is two- or six-celled, borne in clusters, and ranging in color from greenish white to deep red, purple, or black, and in size from one-quarter of an inch to an inch in diameter. Among the grapes of the Northern and Eastern States, the Isabella, Catawba, and Concord are developed from *Vitis labrusca*, and the Delaware from *Vitis æstivalis*; Southern grapes include the Hoary Grape (*Vitis caribæa*), the Musca-

dine (*V. vulpina*), and the Scuppernong (*V. rotundifolia*); while the grapes of the Pacific coast, as the Mission, Sultan, and Tokay, are chiefly of the Old World variety.

The vine is propagated both by layering and cutting, and, more rarely, by grafting. *Layering* should be done in the early spring or late in the summer. For spring layering, a trench is dug two or three inches in depth and cane of the previous season's growth is fastened down with a few pegs. Layering may be done in the summer by bending down and covering the shoots of the present season's growth.



*Grape Growing, in New York State.*

*Cuttings* should be made from young, well-matured wood, and should be from 8 to 20 inches in length, cut close below the lower bud and with about an inch of wood projecting above the upper bud. They may be prepared at any time after the vine has become dormant, and should then be tied in bundles and 'heeled' in or buried in trenches, butt ends up, covered with 3 to 6 inches of soil. The following spring they are planted either directly in the vineyard, or in the nursery from which they are later transplanted as rooted plants. Transplanting

should be done on a damp cloudy day in the spring or autumn, and only strong one-year-old vines from cutting or layering should be used. They should be placed from 8 to 16 ft. apart, preferably in rows running from n. to s. so that the tops of the plant will shade the stem and leaves from the sun. The best fertilizers are those which contain a large amount of potash, and a small proportion of phosphoric acid and nitrogen.

During the first year after planting no pruning or training is usually given, but the next winter a stout stake may be set as a support for the vine and the first pruning should be done. All the canes except the strongest should be cut away, and that cut back to the desired height. The following summer all superfluous shoots should be pruned away, so that the strength of the plant may be concentrated in the main trunk. The commonest means of support for the growing vines is a trellis consisting of posts planted at regular intervals connected by two or more wires several feet from the ground and about 16 inches apart. In order to protect the bunches of grapes from mildew, insects, and frost, they may be covered by ordinary paper bags as soon as they are ripe, made fast by a pin or a small wire. The bags should have a small opening at one of the lower corners to prevent undue gathering of water.

The fruit should not be gathered until almost matured, for it ripens very little after removal from the vine and always retains an excess of acid that is bitter to the taste. After being picked, it should be allowed to lie for a few hours, until the stems are slightly withered. It is then ready for the market. In addition to their employment for wine and raisins, grapes are used as a table fruit and for the preparation of unfermented grape juice prepared both commercially and in the home. The grape contains from 12 to 38 per cent. of sugar, about 2 to 3 per cent. of nitrogenous substances, and some tartaric and malic acids. The skin contains tannin, cream of tartar, and coloring matter; the seeds contain tannin, starchy matters, and fat; and the stem contains tannin, diverse acids, and mucilaginous matter.

The grape is subject to various bacterial and fungous diseases, which may be the cause of serious loss. Downy Mildew is one of the most serious diseases, especially in the Eastern United States. It causes greenish-yellow spots on the upper surface of the leaves and a downy growth on the under side, while

the fruit turns soft and wrinkled and falls to the ground. Grape Anthracnose attacks the stems, leaves, and fruit. It is first noticed by the formation of irregular black spots, having a slightly darker margin, on the leaves and berries. Crown Gall produces an abnormal wart-like growth on the plant. In the earlier stages, the galls are light in color and watery. Black Rot is especially common in the Rocky Mountain region. Ripe Rot appears in the form of reddish-brown dots that cover the upper sides of the leaves. Bitter Rot is similar in appearance to ripe rot, and is most prevalent in the South. The best means for preventing the inroads of the fungous diseases is frequent spraying of the vines with Bordeaux mixture, which should be done in early spring when the buds are beginning to open, but never while the plant is in bloom.

Numerous insects also attack the grape vine. Especially harmful are the Grape Berry Moth, the Grape Cane-borer, the Grape Vine Beetle, the Rose Chafer. See WINE; RAISINS. Consult *Bulletins* of the various State Agricultural Experiment Stations.

**Grapefruit, or Pomelo**, a large citrus fruit, belonging to the family Rutaceae, borne in clusters of three to twelve, resembling a bunch of grapes. Its original home was in the East Indies but it is now found in all the tropical countries, being cultivated extensively in the Mediterranean region and in India and Brazil. It was introduced into Florida in the 16th century and is also grown along the Pacific coast, especially in the region of Los Angeles. The grapefruit is especially sensitive to cold, and thrives best in a dry climate with a temperature ranging between 20° F. and 100° F. The use of the fruit has increased enormously during the last decade. It is almost as ubiquitous as coffee on the American breakfast table and is regarded as exceedingly wholesome and a valuable article of diet. Among the diseases effecting the grapefruit are Foot Rot, Scab, Dieback, Sooty Mould, Blight.

**Grape Hyacinth, or Muscari**, a genus of hardy liliaceous plants, comprising over 50 varieties, very easily grown in ordinary garden soil, and good subjects for naturalization in grass. Most of the species bear blue flowers, though there are white and yellow varieties.

**Grapeshot**, a composite projectile, now obsolete, which consisted of a number of shot sewn into a canvas bag with coarse thread, the bag being made to fit a gun. The

kind of work formerly done by grapeshot is now done by shrapnel. See **AMMUNITION**.

**Graphic Granite**, a variety of granite in which the quartz and feldspar are so oriented that a surface shows some resemblance to the triangular markings of a cuneiform inscription.

**Graphic Methods**, methods of showing the value of a quantity by lines, charts or diagrams, used especially in applied science and economics. The object may be simply to show at a glance the general manner in which one quantity or quality depends upon or changes with another. Thus, if we mark off along a horizontal line a series of points at equal intervals to represent successive years, and then measure along the vertical line through each point a length represent-

members of any framed structure, when in equilibrium under any system of loading, may be determined graphically by an application of the polygon of forces.

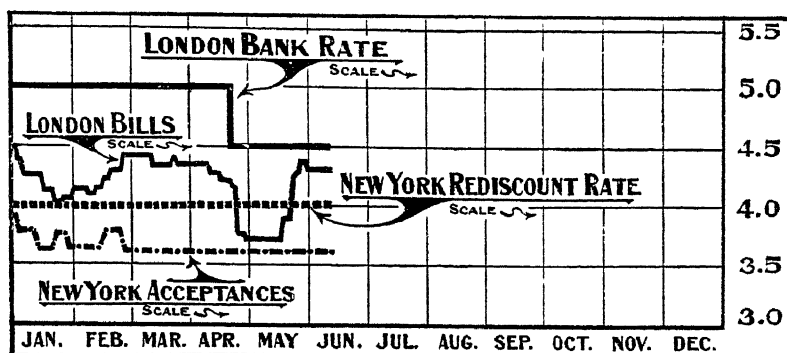
See Merriman and Jacoby's *Graphic Statics* (1880); Hoskins's *Elements of Graphic Statics* (1893); Gray and Lowson's *Graphical Arithmetic and Graphical Statics* (1888); Cremona's *Graphical Statics* (1890); Culmann's *Die Graphische Statik* (1875); Clarke's *Principles of Graphic Statics* (1888).

**Graphite**. See **Black Lead**.

**Graphophone**. See **Phonograph**.

**Phototype**, a temporarily successful but long disused printing process, invented in 1860 by De W. Clinton Hitchcock, as a substitute for wood-engraving.

**Grapple Plant**, a South African herb with



Graphic Chart Showing Banking Rates of New York and London.

ing, say, the population or the values of the exports or imports of a country, we obtain, on drawing a continuous line, or graph, through the ends of the measured lengths, a graphical representation of the yearly fluctuations in the population or trade of that country. The temperature of a body at different times may be given by a curve from which may be found the rate of cooling; a curve may also represent the temperature at different points of a body, and from it may be deduced, if its thermal conductivity be known, the flux of heat across any section of it.

**Graphic Statics**, the method of solving problems in the distribution of forces, stresses, loads, monuments, etc., by means of accurately-drawn figures. In the sequel the capital letters naming a force are placed in the frame diagram on each side of its line of action. In the stress diagram corresponding small letters are placed at the ends of the line denoting each force. The stresses in the

trailing habit bearing purplish flowers, followed by large fruit.

**Graptolites** are a group of fossils very characteristic of Paleozoic rocks from the Cambrian to the Silurian. They are mostly preserved as flattened, glancing impressions on the surface of black shales, closely resembling a branch of seaweed.

**Gras, Félix** (1844-1901), Provençal writer, was born at Malemort, dep. Vaucluse. On the appearance of his first wild mountain epic, *Li Carboundé* (1876), he was at once recognized as the leader of the younger *félîtres*. The fiery *geste* of *Tolosa* (1882) deals with Simon de Montfort and the Albigenes. Gras devoted three tales to subjects connected with the revolution; these have been well translated into English by Catherine A. Janvier—*The Reds of the Midi* (1896); *The Terror* (1898); *The White Terror* (1899).

**Grasmere**, small but charming lake or tarn in Westmorland, England. North of the lake is Grasmere village, with its ancient church

of St. Oswald, described by Wordsworth in the *Excursion*. In the churchyard lie the remains of the poet, his daughter, his sister Dorothy, and Hartley Coleridge. In Town End, to the s.e., resided Wordsworth, and later De Quincey; p. 876.

**Grass Cloth**, a material resembling linen, made in China and the East from fibres of various plants of the nettle order.

**Grasse, tn.**, dep. Alpes-Maritimes, France. The town has a parish church of the 12th and 13th centuries; p. 19,800.

**Grasse, François Joseph Paul**, Marquis de Grasse-Tilly, (1722-88), French admiral, was born in Vallette, Provence, France. He defeated the British admirals, Hood and Drake, off Port Royal, Martinique (April 28, 1781), blockaded the York and James rivers (August 30), and landed 3,000 troops who co-operated effectively with the American forces in the siege of Yorktown. He wrote *Mémoire Justificatif* (1782).

**Grasses, The** (order *Graminaceæ*), are the most important of the products of the vegetable kingdom, forming the food of all herbivorous animals and including the various cereals on which man subsists. Grasses are monocotyledonous plants having leaves with parallel veins and the parts of the flower in threes or sixes. The inflorescence is spike-like or panicle-like, made up of an aggregation of secondary flowers or spikelets, each spikelet being surrounded by bracts or glumes, which are often prolonged into awns. The stems have hollow internodes. Three types of grasses are lawn, pasture, and hay. Among the lawn grasses are blue grass, red-top, Rhode Island bent grass, Bermuda grass, St. Augustine grass and buffalo grass. Red-top, blue grass, fescue, orchard grass, brome grass, bent grass, mesquite, blue stem, rye grass, grama grass are included in the pasture grasses. The hay grasses include red-top, orchard grass, timothy, Johnson grass, brome grass, blue grass, tall oat grass, meadow fescue, rye grass, meadow foxtail, crab grass, Guinea grass, crested dog's tail, etc. Consult *Wing Meadows and Pastures* (1911); John Percival *Agricultural Botany* (1926).

**Grass Finch**, a sparrow common in fields and prairies throughout the eastern United States, recognizable in flight by displaying two white feathers at the side of the tail; also known as 'vesper sparrow.'

**Grasshopper**, a member of either of two distinct families of orthopterous insects, the Acridiidae, and the Locustidae. In both families the last pair of legs is very long and

strong, giving the insects their jumping power. Both families are vegetarian in diet, and a green or brown color is usual. It is the male only which in most cases produces the chirping noise. The most familiar American grasshopper is the red-legged one an acridan common all over the Eastern States and Canada in late summer. Nearly related to it is the large Western species occasionally invading farms from central Nebraska westward in destructive swarms, migrant from their breeding-places in the Rocky Mountain region. Destruction from grasshoppers in 1933 in the northern Great Plains and Rocky Mountain States was the worst in many years. See P. Knight *The Problems of Insect Study* (1933).

**Grassmann, Hermann Günther** (1809-77), German mathematician and Sanskrit scholar, born at Stettin. He is celebrated as the discoverer (1863) of a linguistic law called 'Grassmann's law,' that in words having two aspirated mutes only one tended to retain its aspirate; the law applies to the Indo-Germanic family. See *Life* by Schlegel (1878).

**Grass-moth**, any of the many small moths of the family Crambidae, whose caterpillars feed on grass, while the imago flies about among the vegetation of fields and pastures.

**Grass of Parnassus**. Any member of the genus *Parnassia*, of the Saxifrage family, growing in damp places, having white or pale yellow flowers marked with pronounced veins.

**Grassquit**, any of various small seed-eating finches, mostly of the genus *Sporophila*, very common in the West Indies and Central America.

**Grass Snake**, a non-poisonous colubrine snake widely distributed over Europe, Asia, and N. Africa. The color is olive-gray or brown above, with black bands and spots, and checkered black and white beneath. The usual length is three feet. It is nearly related to the American water-snake.

**Grass-tree**, a name given to various Australian plants belonging to the genus *Xanthorrhæa*, a subdivision of the order Junaceæ. They bear leaves in a tuft at the summit of the woody stem or caudex and a spike of white sessile flowers in April. On account of the resin which exudes from some of the species they are known as 'grass gum-trees.'

**Grass-wrack**, or **Eel-Grass**, a submerged seaplant, with grass-like, bright green leaves and bearing in late summer flowers composed of stamens and pistils alternately

arranged like rows of beads in a long sheath.

**Gratian**, or **Gratianus, Franciscus**, Camaldolite monk and founder of the science of canon law, born at Chiusi in Tuscany, towards the close of the 11th century; first collected the *Decretum*, or the canons issued by popes and councils, at Bologna about 1140.

**Gratianus, Augustus** (359-83 A.D.), emperor of Rome, was the son of the Emperor Valentinian. On the sudden death of his father in 375 he succeeded to the throne; but the army elected his half-brother, Valentinian II., a child of only four years of age, to a share in the empire. Gratian and he only ruled the West, Valens I. being emperor of the East.

**Gratiola**, a genus of hardy plants belonging to the order Scrophulariaceæ. Some species are worthy of garden cultivation, and others known as 'hedgehyssop' were formerly reputed to have medicinal value.

**Grattan, Henry** (1746-1820), Irish politician and patriot, born in Dublin. He was instrumental in obtaining (1779) the removal of the vexatious restrictions on Irish commerce. Grattan became so popular that a vote of £50,000 was made to him. His *Speeches* and his *Miscellaneous Works* were both published by his son (1822). See *Lives* by his son, Henry Grattan (1839-46), and R. Dunlop (1889).

**Grätz, Heinrich** (1817-91), Jewish historian, born at Xions (Posen). His *Geschichte der Juden* (1853-70; trans. by Bella Löwy, 1891-8) is a standard work on the subject.

**Grau, Maurice** (1849-1907), German-American opera manager, was born in Brünn, Moravia. He began his career by bringing Aimée to the United States (1872). The next year he formed the Clara Louise Kellogg Opera Co., and afterwards managed the tours of Salvini, Rubinstein, Patti, Bernhardt, Irving, Jane Hading, Mounet-Sully and Mme. Réjane. In 1897-1903 he was manager of the Metropolitan Opera House, New York.

**Graun, Karl Heinrich** (1701-59), German singer and composer, born at Wahrenbrück in Saxony. He was appointed royal musical director, and wrote many operas, of which *Merope* (1756) is the best. His greatest achievement was the oratorio *Der Tod Jesu* (1755), which is still annually performed at Berlin.

**Gravel**, a deposit of rounded, water-worn stones. Gravels are produced by the action of moving water, usually of streams or of

the sea. In course of time gravels may become consolidated by cementing agents and by pressure and then form 'conglomerate.' The pebbles in a gravel may consist of any kind of rock, but most commonly they are of quartz. In addition to marine and fluvial gravels, a third group is often recognized—the glacial gravels. Gravel is extensively used for making concrete and mortar, and as road material.

**Gravelines, tn., dep. Nord, France.** In 1558 the French were defeated here by the Spaniards. Off the coast, in 1588, the Spanish Armada was defeated. In 1658 Gravelines was recaptured by the French; p. 6202.

**Gravelotte, vil., in Alsace-Lorraine, Germany**, the scene of the most sanguinary battle of the Franco-German war (Aug. 18, 1870), sometimes called the battle of Saint-Privat, which resulted in Bazaine's retreat to Metz.

**Graves, Robert James** (1796-1853), Irish physician, was born in Dublin. Graves reformed many hospital abuses, and introduced the training of medical students by clinical practice in the wards. His *Clinical Lectures* (1848) established his reputation.

**Gravesend, mrkt. tn. and munic. and parl. bor. in Kent, England.** Here are Rosherville Gardens, long a resort of Londoners. Milton Mount College is an institution for the daughters of Congregational ministers. Forts in the vicinity guard the approach to London; p. 35490.

**Gravitation.** Experience shows us that every portion of matter falls or tends to fall in a vertical line towards the surface of the earth. When bodies rise, like a balloon in air or a cork in water, they do so because they are lighter, bulk for bulk, than the air or water, the denser matter being pulled down more strongly, and so pushing the lighter material up. In virtue of the approximately spherical form of the earth, these vertical lines, when drawn at all points of the earth's surface, will pass very near to the center of the earth. Hence we conclude that all bodies are acted on by a force directed very approximately towards this center. Two questions at once demand an answer. (1.) Is this power of attracting small bodies peculiar to the earth, or is it possessed by other masses? (2.) Why should the lines of attraction pass through the earth's center? These questions were completely answered by Newton in his great generalization known as the law of gravitation, which states that every particle in the universe attracts every other particle

with a force which acts in the line joining them, and which is directly proportional to the product of the masses, and inversely proportional to the square of their distance apart. The mathematical deductions from this law were shown by Newton to be in remarkable accord with the observed motions of planets and satellites.

Two hundred years of observation and calculation have established more and more completely the sufficiency of Newton's law as a description of the motions of planets, comets, and meteoric stones round the sun, and of the satellites round the planets. Many attempts have been made to explain the mechanism of gravitation, but so far with small success. Le Sage's theory of ultramundane corpuscles seeks to find the explanation of gravitation in the impact of a countless number of very small particles upon the much grosser particles which are supposed to constitute matter. If we assume these ultramundane corpuscles to be moving about with high velocities, and to be able to pass freely through the spaces separating the atoms of the densest matter, then it may be shown that any two portions of matter will shield each other in such a way that more impacts will take place on the sides removed from each other than on the sides opposing each other and that this will give rise to an attraction inversely as the square of the distance. Clerk Maxwell has discussed this theory in the light of the conservation of energy, and has found it to be insufficient for its purpose.

Whatever be its origin, the force of gravitation, as it is observed to be, is ultimately the prime source of most of the energy of the solar system. Helmholtz first showed that the high temperature of the sun is the result of the transformation of gravitational energy into heat as the sun gradually contracted from its original widely extended volume to the volume it now has; that this contraction is still going on, developing greater heat; but that at present there may be more heat lost by radiation into space than is gained by the contraction, so that the sun is a cooling body. Now, with comparatively insignificant exceptions, the energy utilized by vegetables and animals is solar. Then, as regards these exceptions, some are obviously gravitational in their origin—such, namely, as arise from the earth's own internal heat, or from the tidal action of the moon. Thus we recognize in gravitation one of the great sources of the various forms of energy whose

continual transformations make up the activity of the universe. The one source which at first sight is not gravitational is that which depends upon chemical affinity—that is, upon the intermolecular forces. But Kelvin has shown that these intermolecular forces may be ultimately of the same character as gravitational forces.

Einstein, however, shows that Newton's laws represent a special case of the relativity theory. For a popular presentation, see David Dietz's *The Story of Science*.

**Gray, Asa** (1813-88), American botanist, born at Paris, N. Y. With Dr. Torrey he attempted a new and natural classification of plants and an exhaustive study of N. American flora, and soon became known as an authority in taxonomy and morphology. *How Plants Grow* (1858) and *How Plants Behave* (1872) display his method and manner and were for years popular textbooks. He was an eager exponent of Darwinism, being one of the first Americans to follow its teachings. His published works deal with the distribution of species in a philosophical manner and he believed that the theory of natural selection was not in opposition to religious ideas. His works include the *Botanical Text-book* (1836, 1839, 1869); *The Flora of N. America* (1838-43) with Dr. Torrey; *Manual of the Botany of the Northern United States* (1847); *Genera Borealia Americana*, illustrated by Sprague (1848-50); *Botany of Japan in Relation to N. America* (1859); *Synoptical Flora* (1878).

**Gray, Elisha** (1835-1901), American inventor was born at Barnesville, Ohio. He claimed the invention of the speaking telephone on the score of specifications filed February 14, 1876, but the patent was finally awarded to Alexander Graham Bell. He wrote *Harmonic Telegraphy and Telephony* (1878).

**Gray, Henry Peters** (1819-77), an American painter of historical genre and portrait subjects, born in New York. He is represented in the Metropolitan Museum, New York, the Pennsylvania Academy at Philadelphia, the Corcoran Gallery at Washington, and other public galleries.

**Gray, Horace** (1828-1902), American jurist, born at Boston, Mass. The distinguished ability and great learning with which he discharged his judicial duties led in 1882 to his appointment by President Arthur as Associate Justice of the U. S. Supreme Court, in which position he served until his death.

**Gray, John Purdue** (1825-86), American

alienist, was born in Philadelphia. He was first to use the microscope for examining brain tissue at asylums.

**Gray, Robert** (1757-1806), American navigator and discoverer, the first to carry the American flag around the world, was born at Tiverton, R. I. Gen. A. W. Greely says that Gray entered the Columbia river in August, 1788; but there is no doubt that he did explore the stream in May, 1793, and this fact was one of the chief grounds for the claim of the U. S. to the Oregon region.

**Gray, Thomas** (1716-71), English poet, born in London. He had a friend in Horace Walpole, and went (1739) with him for a continental tour. They quarrelled at Reggio (1741), and Gray went off to Venice, whence he returned to London (1741). The first of Gray's original poems, the *Ode on Spring*, was written before June, 1742, and his 'sonnet' of lament for West in August, as were also the *Ode on a Distant Prospect of Eton College* and the *Hymn to Adversity*. Reconciled to Walpole, he sent him (March, 1747) the *Ode on the Death of a Favorite Cat*. The *Elegy* he sent to Walpole on June 12, 1750. The churchyard at Stoke Pogis and its environs are the scene of this great poem. Though the two 'Pindaric Odes,' especially *The Bard*, were epoch-making, it was long before they became popular. Gray had begun to study Norse literature, and the fruit of these researches appeared in spirited versions from the sagas—*The Fatal Sisters* and *Descent of Odin* (1768). In the history of English literature no one who published so little holds so high a place. See *Poems* (1768); *Gray and His Friends* (1890); *Poems* (ed. Bradshaw, 1891); *English Poems* (Camb. Univ. Press, 1898); *Letters* (Bohn's Series, I. 1900; II. 1904).

**Grayling**, a small fresh-water fish of the salmon family, genus *Thymallus*, common in northern streams, and distinguished by the very great dorsal fin, which has from thirteen to twenty-three rays. An American species occurs sparingly about Lake Superior, and a second in Montana.

**Grays Inn**, one of the four great societies of barristers in England which regulate admission to the bar, etc.

**Grayson, Cary Travis** (1878-1938), U. S. naval officer, born in Virginia, was surgeon-general of the Naval Hospital at Washington and served as physician to three Presidents—Theodore Roosevelt, Taft and Wilson. The latter raised him to the rank of rear admiral. He became chairman

of the American Red Cross in 1935.

**Grayson, William** (?-1790), American soldier in the Revolutionary War, was born in Prince William co., Va. He was appointed aide-de-camp to Washington in 1776, and was conspicuous in the battle of Monmouth (1778) as colonel of a Virginia regiment. He served in the Continental Congress in 1784-87; was a United States senator from Virginia to the First Congress.

**Gray's Peak** (14,341 ft.), named for Asa Gray, one of the loftiest summits of the Rocky Mts., in Colorado.

**Graywacke**, a term applied to dark-colored fragmental rocks of variable composition, the constituents including quartz, feldspar, mica, chlorite and hornblende, besides particles of other rocks.

**Grazzini, Antonio Francesco** (1503-83), Italian author, wrote several comedies, including *La Gelosia*, *La Spiritata*, *I Parentadi*, *La Pinsochera*, and *L'Arzigogolo*; also *Le Cene*, a collection of tales on the lines of Boccaccio's *Decameron*.

**Grease**. See **Lubricants**.

**Greasewood**. A name applied to various North American desert plants, chiefly members of the *Chenopodiaceæ*; but particularly to *Sarcobatus vermiculatus*. Of the latter the fleshy foliage, numerous winged seeds, and even the young shoots are eaten by livestock.

**Great Auk**. See **Gare-Fowl**.

**Great Barrier Reef**, a series of coral reefs extending along the e. of Queensland, Australia, for over 1,300 m. Its foundation represents the old coast-line of Australia. The area has been computed at some 100,000 sq. m. See W. Saville Kent's *The Great Barrier Reef of Australia* (1893).

**Great Barrington**, tn., Berkshire co., Mass. Situated in a beautiful valley, it is one of the most attractive resorts of the region. The Sedgwick School is situated here. The town was for some years the home of William Cullen Bryant, who was town clerk. During Shays' Rebellion it was the scene of many disorders, particularly on Sept. 12, 1786; and on Jan. 25, 1787, a contest took place near by between the rioters and the militia; p. 5824.

**Great Basin**, inland drainage area of 210,000 sq. m. in the Western United States. It comprises S. Oregon, E. California, nearly all Nevada and W. Utah. Its elevation ranges from a little below sea-level up to nearly 7,000 ft. in the valleys, while the highest peaks of the mountains reach from 9,000 to 11,000 ft. In a past geological period, two

deep lakes covered large portions of this region; the depressions which indicate their former limits are called Lake Lahontan and Lake Bonneville. A small portion of the area of the latter is now occupied by Great Salt Lake. The Humboldt and Sevier are the chief rivers.

**Great Bear Lake, N. W. Territories, Canada;** length, 175 m.; breadth, 25 to 45 m.; area, 11,200 sq. m. Its waters abound in fish, and are sometimes frozen over nine months in the year.

**Great Britain,** so called to distinguish it from Brittany in France, lies on the continental plateau of Europe, within the 100-fathom line. It is by far the largest island off the shores of the continent, having an area of fully 88,000 sq. m. North Britain, or Scotland, falls into three natural divisions—the Highlands, the Central Lowlands, and the Southern Uplands. The loftiest heights occur in the Grampian range of the Highlands where several summits rise above 4,000 ft., such as Ben Macdhui, Cairntoul, Ben Avon, and Ben Nevis (4,406 ft.), the highest elevation in Great Britain.

From the Cheviot Hills the backbone of England, the Pennine range, runs s. to the Peak in Derbyshire. It is a great arch of Carboniferous rocks from which the Coal Measures have been stripped off, but they lie here and there along the foot of the range. Among the highest summits are Scafell Pike (3,210 ft.), the loftiest peak in England, Skiddaw, and Helvellyn. Wales is a mountainous country built up of Cambrian and Silurian rocks, with patches of Coal Measures in synclinal troughs, the largest being the South Wales coal field, lying in a basin of Old Red Sandstone. The peninsula of Devon and Cornwall is very similar, consisting of Devonian rocks, which are of the same geological horizon as the Old Red Sandstone and Carboniferous rocks. They form tablelands from 1,500 to 1,600 ft. high, as Dartmoor and Exmoor.

Round the extremity of the Pennine range lie Triassic plains, the Cheshire plain between the Pennine range and the Welsh mountains, the plain of York, and the central plain s. of the Peak. The hills in this part are the prominent sections of the oolitic and chalk escarpments. To the former belong the Blackdown Hills in East Devonshire, the Cotswolds (about 1,200 ft.), and the moors of Yorkshire (1,500 ft.). To the c. a Jurassic belt crosses England, bounded on the c. by the chalk escarpment which forms the Dorset and Marlborough Downs, the Chiltern Hills,

and the Wolds of Lincolnshire and Yorkshire, terminating at Flamborough Head. The chief rivers in Scotland are the Spey, the Tay, the Forth, the Tweed, and the Clyde. In England the Thames (210 m.), the longest river in Great Britain, rises in the Cotswold Hills. It is navigable by large steamers to the docks of London, 47 m. from the sea. The Humber is the estuary of two large rivers—the Yorkshire Ouse, navigable for small craft to York; and the Trent (150 m.), navigable for small sea-going craft to Gainsborough. The Great Ouse has a length of 150 m. and is navigable to Bedford. The Severn (200 m.), rising on Plinlimmon, in Wales, runs s. to the Bristol Channel. The Dee also rises in Wales, issuing from Lake Bala.

Lakes are particularly numerous in Scotland, and several of them are far below the sea-level. Loch Ness, 23 m. long, has a depth of 751 ft.; while Loch Morar descends to 1,017 ft., or about 985 ft. below sea-level. Loch Lomond, 21 m. long, is the largest lake in the island (27 sq. m.). In England the only lakes of importance are in Cumberland and Westmorland, the largest being Windermere, with a length of 10½ m. The coasts are less indented on the e. than on the other coasts. The chief inlets are the wide Moray Firth, the Firth of Tay, and the Firth of Forth, in Scotland; the Humber, the Wash, and the estuary of the Thames, in England. The s. coast of England has several protected harbors, among them Southampton, Portsmouth, and Plymouth. The Bristol Channel runs far into the land, and the mouth of the Mersey forms the important port of Liverpool. The west coast of Scotland is much indented, the Firth of Clyde being an important commercial highway; and innumerable islands lie off the coasts, the Inner and Outer Hebrides, the higher points of the submerged continental plateau. (Of the English coasts there are only three islands deserving special mention—the Isle of Man, Anglesea, and the Isle of Wight.)

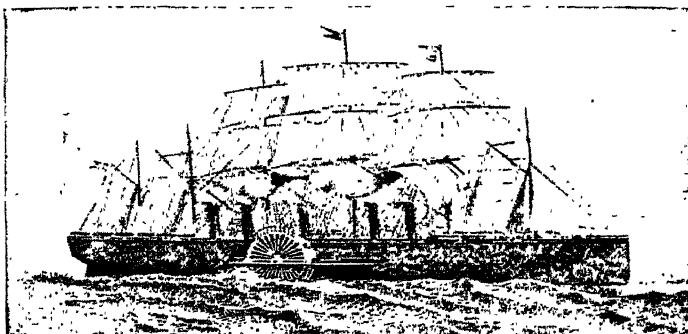
The most important minerals of Great Britain are coal and iron. Owing to its insular character and its proximity to the Atlantic Ocean, Great Britain enjoys a more equable climate than the neighboring countries of the continent. The annual mean for Greenwich, 50°, is only one degree less than that of Paris, while the difference between the warmest and coldest months is 26°, or 3° less than at Paris. The fauna is in general that of the Palearctic region, but as Great



Britain was finally separated from the continent towards the close of the Glacial period, the species are less numerous than on the continent. One bird at least, the red grouse of Scotland, is a distinct species, and several species of trout and char are peculiar to Great Britain. Of insects there are many odd species and varieties. The only large wild animals are the red deer in Scotland and Ex-moor, the fallow deer, and one or two herds of wild cattle preserved in private parks. The fox, hare, rabbit, and squirrel are found everywhere; the badger and the otter are becoming rare.

The flora also is on the whole of a European type, and consists of about 1,500 species of flowering plants, and perhaps twice as many cryptogams. Still, there are several

of which coincides with the center of the sphere. The equator and the meridian and ecliptic circles are 'great circles' on the globe. The shortest distance between any two points on the surface of a sphere lies along the arc of a great circle which passes through the places. Unless both places be on the equator, or on the same meridian, such a great circle cuts the successive meridians at varying angles, so that its compass-bearing is continually changing. If such a course along a great circle be plotted out on a chart on Mercator's projection, it will be found that the course is represented by a line which curves to the polar side of the rhumb line, or the straight line joining the two places on the chart. That point of the curve which is nearest to the pole is called the 'vertex,' and



*The Great Eastern.*

non-European forms, of which three are American species. The chief indigenous trees are the oak and beech, and the Scotch fir and birch on the higher grounds and in the north. Alpine forms occur in the higher parts of the mountains. Dairy-farming flourishes most in the central plain and Cheshire, grazing in Yorkshire and Scotland. The Highlands of Scotland, the Lake District, and part of Wales consist to a large extent of bare hills, with scanty pasturage for sheep or deer, and valleys where a few cattle can graze. Forests now cover only four per cent. of the surface.

**Great Britain & Northern Ireland, United Kingdom of,** is composed of the main island of Great Britain, numerous small surrounding islands, and the six northeastern counties of Ireland. See ENGLAND AND WALES; SCOTLAND; ULSTER; CHANNEL ISLANDS; BRITISH EMPIRE.

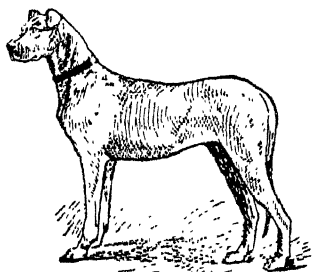
**Great Circle Sailing.** A 'great circle' on the surface of a sphere is a circle the center

that which is farthest from the rhumb line is called the 'point of maximum separation.'

The method by which a vessel is navigated along the arc of a great circle is called 'great circle sailing.' The difficulties presented by the computations in great circle sailing have been reduced to a minimum for ordinary navigators by the invention of ingenious devices whereby charts are prepared on what is known as the gnomonic projection, and use is made of great circle protractors, the sphereograph and other instruments.

**Great Dane, or Boarhound,** a large dog of ancient type, formerly used as a protector of property and persons as well as a hunter. The Great Dane is a huge, powerful animal, brindled tan with black spots or stripes, whole-colored in various shades of fawn, or white with spots of black. It stands at least 30 inches high and weighs from 140 to 180 pounds. The animal has a naturally docile disposition but if uncontrolled may be

savage and dangerous. It is intelligent, faithful and devoted to its master.



*Great Dane.*

**Great Eastern**, a paddle and screw iron merchant steamer, designed by I. K. Brunel and Scott Russell, and built in London, in 1854-7. She was then by far the largest vessel in existence, being 679 ft. 6 in. long, and 82 ft. 8 in. broad with a tonnage of 18,915. Never a very successful speculation, she was useful, however, as a cable-laying ship. See ATLANTIC CABLE.

**Greater Antilles.** See **West Indies**.

**Great Falls**, city, Montana. Great Falls, named for one of the three nearby falls in the Missouri River, is the half-way point between the Glacier and Yellowstone National Parks, and an important link on eight highways. Educational institutions include the Ursuline Academy, St. Mary's Institute. Great Falls is the center of a rich coal, copper and zinc mining region; p. 28,928.

**Great Fish River**, or **Back River**, Northwest Territories, Canada. On Montreal Island, in the estuary which forms its mouth, were found in 1859 the remains of Sir John Franklin's expedition.

**Great Horned Owl.** See **Eagle Owl**.

**Great Lakes**, **The**, a group of lakes, comprising lakes Superior, Michigan, Huron, St. Clair, Erie, and Ontario, lying between Canada and the United States, except Lake Michigan, which is wholly within the latter country. Connected by rivers, they form the largest body of fresh water in the world, their area exceeding 90,000 sq. m. They are drained northeastwards by the St. Lawrence River to the Atlantic. The moderating influence of this volume of fresh water on the temperature of the surrounding country is so considerable that fruit culture has been largely developed along the shores. The lakes are in the midst of a highly productive region, and furnish a means of transportation eastward of the grain, timber, ranch prod-

ucts, and mineral products of the West, and, again, westward of coal and manufactured articles of the East. More than one-half of the vessels registered in the United States are found on their waters. The principal lake ports are Duluth, Chicago, Milwaukee, Detroit, Toledo, Cleveland, Erie, Buffalo, Hamilton, Toronto, and Kingston. See the articles on the separate lakes; also the article on the SAINT LAWRENCE RIVER.

**Greentrakes, Valentine** (1629-83), known as 'the stroker,' was born in county Waterford, Ireland. He began to cure scrofula and other diseases by 'laying on of hands' in Ireland and England, and wrote a *Brief Account of himself* (1666).

**Great Rift Valley**, a depression extending from the Jordan and Dead Sea valleys of Palestine, through the Red Sea, thence across Abyssinia and French Somaliland to Lake Rudolf.

**Great Salt Lake**, in Utah, stretches along the western base of the Wahsatch Mountains, about 4,200 ft. above the sea, forming a principal drainage center of the Great Basin. It is over 80 m. long and from 20 to 32 broad, but for the most part exceedingly shallow. Well-marked shore lines on the mountains around, reaching 1,000 ft. higher than the present level, show that it had formerly a vastly greater extent. Its tributaries are the Bear, Ogden, Jordan, and Weber, the Jordan bringing the fresh waters of Lake Utah. The lake has no outlet save evaporation, and its clear water consequently holds at all times a considerable quantity of saline matter in solution. The manufacture of salt by evaporation of the lake water is an important industry. The first mention of Great Salt Lake was by the Franciscan friar Escalante in 1776, but it was first explored and described by Fremont in 1843. See SALT LAKE CITY, UTAH.

**Great Seal.** See **Seal**.

**Great Slave Lake**, Northwest Territories, Canada, has an area 7,100 sq. m. Its shores are very irregular, and numerous bays occur, the most important of which are M'Leod Bay on the n. and Christie Bay on the s. The n. side is bounded by lofty cliffs, and from the w. side issues the Mackenzie River, which carries its waters to the Arctic Ocean. The lake is frozen over for six months during each year.

**Great Slave River**, Canada, issues from the w. of Lake Athabasca, in the n.e. corner of Alberta, and flows 300 m. into Great Slave Lake near Fort Resolution. Its chief

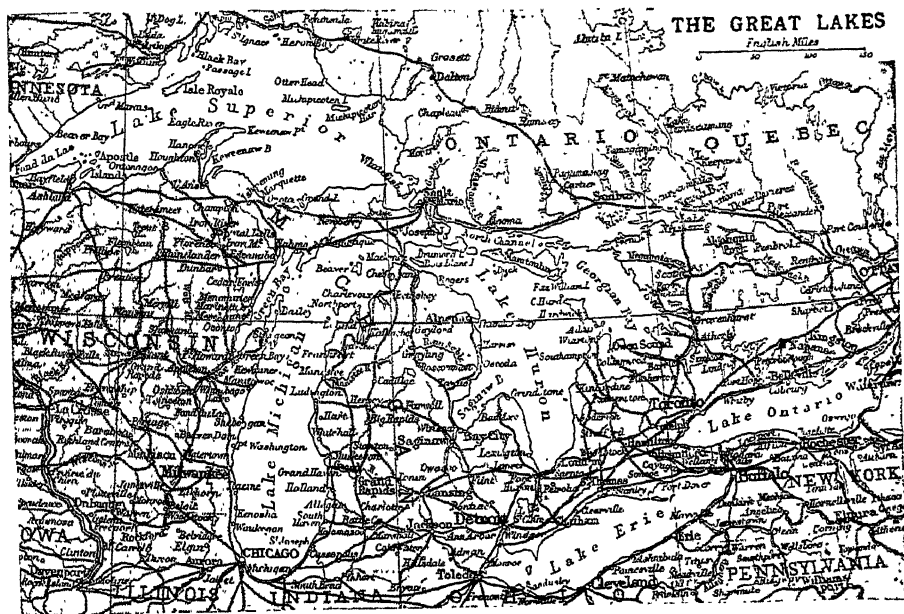
tributary on the w. is Peace River. Except for the rapids near Fort Smith, it is navigable during a part of the year.

**Great War (1914-19).** See **Europe, Great War of.**

**Grebe,** a fresh-water, migratory, diving bird of the family Podicipicæ, one of the lowest in rank among birds. It has a duck-like body, brownish and white plumage, long neck, short wings, no tail, and large flattened toes furnished with lobate membranes serving the purpose of webs. Most of its life is spent in fresh water lakes and ponds, but in winter and during migration it often resorts to the sea. It is an expert diver. There are

called the Northern Sporades, lies to the n.e. of Eubœa. Most of the islands are of volcanic origin, and are very fertile, producing wheat, silk, cotton, wine, honey, figs, oranges, raisins, and other fruits. The inhabitants of the Sporades are also employed in fishing for sponges and coral.

**Grecian Architecture.** The Doric is the oldest style of Greek architecture. The earliest example which remains is the temple at Corinth, which was built about 550 B.C. There is now no doubt, although the intermediate steps are lost, that the Doric style took its origin from the rock-cut tombs of Beni-Hassan in Egypt. After the temple at



several species of grebe, the best known being the Dabchick, or Little Grebe. Other species are the Horned Grebe occurring in the northern parts of North America; the Eared Grebe of Central Europe and Asia and Western America, and the Great Crested Grebe found in nearly all parts of Europe and Asia.

**Grecian Archipelago.** The, consists principally of two groups of islands in the Ægean Sea, called Cyclades and Sporades; the first from their encircling the sacred island of Delos, the second from their being scattered in a wavy line. The former lie to the s.e. of Greece while the latter skirt the western coast of Asia Minor. A further group,

Corinth, the next remaining example is the temple at Ægina, built about 550 B.C. The temple of Theseus and the Parthenon at Athens, 438 B.C., those of Zeus at Olympia, 440 B.C., Apollo Epicurius at Bassæ, Minerva at Sunium, and all the best examples of the Doric style of Greece are of the age of Pericles. As the Doric art progressed, the early massive forms gave place to more elegant and slender proportions. In the temple at Corinth the column is only 4.47 diameters in height; in the Parthenon, which is universally recognized as the finest example of the style, the column is 6.025 in height, and in later examples it becomes still taller and thinner. The Parthenon is built entirely of

white marble, and the whole of the masonry in this, as in other Doric works of importance, is put together with the most perfect workmanship. There seems to be no doubt that this and other Greek temples were adorned externally with color.

The Ionic style took its rise about 500 B.C. and seems to have originated from the influence of Assyrian art. The volutes of the capitals are particularly indicative of an eastern origin, the scroll being an ornament of very frequent occurrence in all eastern art. The finest examples of the Ionic style remaining in Greece are the temples of Wingless Victory and the Erechtheum at Athens, built about 450-420 B.C. The celebrated Temple of Diana at Ephesus was of the Ionic order. The Ionic is a graceful and elegant style, and trusts to ornamental carving for its effect. The honeysuckle ornament, so commonly used both in Assyrian and Ionic architecture, is a good example of the improvement effected by the Greeks on the original type.

The Corinthian style was the latest introduced, and combines to some extent the characteristics of both the preceding. It unites and blends together the Egyptian and Assyrian elements. This order was first used about the time of Alexander the Great, the earliest example extant being the Choragic Monument of Lysicrates 335 B.C. There are also the Temple of the Winds and that of Zeus Olympus at Athens, the latter being one of the largest and finest examples of the style. The Corinthian is the most florid of the Greek styles. Besides the above styles, which constitute the Greek orders of classic writers (see ARCHITECTURE, the Greeks also used Caryatides, or female figures, in place of columns, as in the Erechtheum; and Telamones or giants, as at Agrigento.

Greek temples are technically classed and designated by the mode in which the columns of the porticoes are arranged. The cell, or temple proper, is a square chamber contained within four walls; the simplest form of portico is called distyle in antis, the two side walls being continued past the end wall, and terminated with antæ, or pilasters, with two columns between. When the portico has four columns between the antæ, it is called tetrastyle. The temples have generally the same arrangement at both ends. In front of both ends of the plan distyle in antis, there is frequently placed a range of six columns, and from the flank columns a row is continued along both sides, thus forming a continuous portico all round the edifice. Such

an arrangement is called peripteral, and the temple is designated hexastyle and peripteral. This was a common arrangement. See ARCHITECTURE. Consult Ferguson's *History of Architecture*.

**Greece**, a kingdom of Europe occupying the southern extremity of the Balkan Peninsula, together with the Ionian Islands on its west coast, and most of the islands of the Ægean Archipelago on the e. coast. The kingdom of Greece may be divided into three parts; the mainland, the Peloponnesus, or Morea, and the Islands, the first two divisions being connected by the Isthmus of Corinth, a strip of land only three and a half miles wide. Albania, Serbia and Bulgaria on the n. constitute the only land boundary, the other sides being washed by the surrounding waters—the Ægean and Ionian Seas, and the Mediterranean. The physical configuration of Greece is determined by the Dinaric Alpine fold, which traverses the entire peninsula in a southeasterly direction, and then turning e. through Crete, forms the southern margin of the Ægean depression. Except in Upper Thessaly, no part of Greece is more than 40 m. from the sea.

In general the climate resembles the Mediterranean sub-tropical, but Greece is peculiar in its extremes of temperature. The hot blasts from Africa sometimes cause intensely hot summers, while the winds from snow-capped mountains make the winters very cold. Rainfall is copious in the mountains of the w., but in the eastern part of the country droughts are prevalent. Below 1,500 ft. evergreens prevail—cypress, myrtle, and olive, with oleander, iris, anemone, gladiolus, and aromatic shrubs. The vine, fig, orange, and tobacco flourish, and cotton and the date. Above 1,500 ft. begins a copious Alpine flora. The fauna includes bears, foxes, wolves, boars, deer, rabbits, and game birds of several varieties. Greece has a variety of minerals, and mining seems destined to occupy an increasingly important place in her economic development. The minerals include chromite, copper, emery, iron, lead, lignite, manganese, magnesite, nickel, tin, sulphur, and zinc. Marble is quarried to a slight extent, Parian marble being world known. The chief mining districts are Thessaly, Eubœa, and the Ægean Islands.

Agriculture is the chief occupation and the principal crops are currants, olives, cereals, tobacco, figs, wine, and nuts. Only one-fifth of the soil is cultivable; 34 per cent. is waste land and 31 per cent. is meadow and pasture.

Honey from Hymetus has a world-wide reputation. Rice is grown in Macedonia and cotton in Thessaly, Bœotia, Messina, and the Ægean and Ionian Islands. The silk industry is a growing one. Horse breeding, cattle raising, and sheep rearing are carried on by the peasants, but with no system and little attention to improving breeds. Large herds of goats are found in all parts of Greece, especially the mountainous districts. Manufacturing is limited, but is making considerable progress, especially in the production of textiles, leather, and silk. The chief industries, however, are those dealing with agricultural and animal products, as distilleries, tanneries, soap works, and sugar refineries. Sponge fisheries are found on the shores of the Ægean.

The bulk of the foreign trade is with Great Britain and the United States. Trade between Greece and the United States has greatly increased since the Great War. The United States takes Greek currants, olives, tobacco and marble, and supplies, in return, wheat, sugar, agricultural produce, coal, raw cotton, petroleum, edible oils, and miscellaneous manufactured articles. In spite of her extensive coast line, Greece has comparatively few good harbors (Piræus, the port of Athens, is the most important), but her mercantile marine is excellent. On account of its physical aspect, access by sea to every important district is easy. There are about 8,000 m. of roads and almost all travelling in the hill countries is by horses and mules. A canal across the Isthmus of Corinth was opened in 1893. In 1940 there were 1,672 m. of railroads and 1,855,000 tons of shipping. The population is 7,197,000 exclusive of numerous Greeks in European Turkey, Asia Minor, and Crete. Athens is the capital (p. 652,000). Other large towns are Salonica (236,000); Patras (61,000); Corfu (27,175); Candia (24,848); Canea (24,976); Volo (30,046); Kavalla (50,000).

The population includes three main stocks, besides recent invaders—(1) aboriginal Mediterranean brunettes, purest in Crete and the remoter islands; (2) dark, sallow, brachycephalic Alpine highlanders, typically represented in Albania, but intrusive since Roman times over all the mainland of Greece, and over sea as far as Andros; (3) scanty remains of those tall, fair or ruddy northerners whose successive invasions (Thraco-Phrygian, about 1500 B.C.; Dorian, 1000 B.C.; Galatian, 275 B.C., etc.) mark the main turning points of Ægean history. The invading

Saracen (650-1000 A.D.) and Turk (1500-1800 A.D.) have hardly affected the ethnic type; it is Albanian blood which mainly differentiates modern from ancient Greek.

The large majority of the population are members of the national branch of the Orthodox Greek Church, which is in nominal subjection to the patriarch of Constantinople, but practically is administered by its synod and the metropolitan of Athens. Complete religious toleration exists. Elementary education is free, and is compulsory from seven to twelve, but the law is badly enforced, and much illiteracy exists. There are three grades of schools: primary or communal, Hellenic or intermediary, and superior or Gymnasias. The system is founded on that of Germany. Technical and professional education is supplied by the University, the polytechnic, and the industrial academy (all in Athens), and by two schools of agriculture. There are also several schools of archæology maintained by foreigners.

Until April, 1924, Greece was a constitutional monarchy, established in 1830. The new constitution proclaimed in June, 1927, provided for the establishment of a second House (Senate); for the election of parliament by direct, universal and secret voting, and of the Senate partly by the people—partly by the Parliament and Senate in a joint meeting, and partly by the corporations of the different professions. In March, 1924, the Constituent Assembly deposed King George and declared Greece to be a republic subject to a plebiscite in April, which declared overwhelmingly in favor of the plan.

The people who called themselves Hellenes, and were known to the Romans as Græci, probably entered the country from the north in successive bands. From modern discoveries made at Troy, Mycenæ, Tiryns, and elsewhere, it is quite clear that the Troad and the eastern coast of Greece were once governed by wealthy and powerful chiefs. The period of this Mycenæan civilization has been placed at 2000-1000 B.C. How it came to an end is unknown, but it is quite probable that this civilization fell before the attacks of ruder tribes from the n.w. In consequence of these migrations, colonies are said to have been founded by the expelled nations of the peninsula in Asia Minor, where they became grouped as Æolian, Ionian, and Dorian.

The period in which Greece was settling down after migrations—the period from 1000 to 700 B.C.—is hardly known to us historically. In those dark ages the immigrants be-

came grouped into cities under aristocratic governments, with a 'king' at the head. Some of the oracular shrines to which the Greeks repaired to consult the deity grew to be of national importance. The Olympic games also developed into a great national festival (see OLYMPIC GAMES). About the middle of the 8th century the monarchy, which had hitherto formed a part of the government of the cities, disappeared; only at Sparta was the office retained. About twenty years later began the period of colonization, which is so striking a feature in the history of Greece; at the same time a new era of commerce was opened, extending all over the Mediterranean.

Of two cities only can any details be given—Athens and Sparta. Of these, Athens became the great democratic city, the home of free institutions and individual development. Sparta, which was far more representative of the Greek ideal, was severely 'regimented'; the citizen not only lived for the state, but was never free from state control. The constitution was traditionally carried back to Lycurgus. See ATHENS; SPARTA.

The impulse to colonization lasted on into the 7th century with increasing force. The settlers in the colonies were not all from one source; each band brought with it rules and customs which had to be harmonized with those of the rest. We now hear for the first time of written codes. Zaleucus and Charondas were instructed to draw up laws for their cities in Italy and Sicily and later on in the century, the laws of Athens were published. Another effect of the ferment now going on in the Greek world was the appearance of the so-called 'tyrants'—men who raised themselves to a despotic position in the cities, and maintained their power by force. In this century also, partly owing to more frequent contact with foreign nations, and partly to the habit of meeting at the public games, which were greatly favored by the tyrants, the Greeks became more conscious of a common nationality: one name, Panhellenes, and later Hellenes, came into use for the whole nation.

Owing to the impulse given to trade and maritime adventure, the Greeks now began to improve their ships; and a new system of weights and measures, the Æginetan, perhaps even the beginning of a coinage, was introduced by Pheidon of Argos, who for a time raised his city to something of her old pre-eminence. The century was remembered for two great wars which occurred in it: (1)

the war between Chalcis and Eretria, both in Eubœa—a war in which most of the leading Greek states took part on one side or the other; and (2) the second Messenian War 645-628 B.C., in which Sparta finally reduced Messenia to subjection.

Of Athens we hear little. Toward the end of the century Cylon attempted to make himself tyrant of the city, but without success. After Cylon's attempt, Draco was commissioned to write out the laws of the city. The constitution of the city was at this time severely oligarchic. The council of the Areopagus had supreme authority over everything. Soon after the beginning of the 6th century the situation at Athens became critical. The nobles were divided into factions; the commons were being sold into slavery. A contest was also raging with Megara for the possession of Salamis. The city was beginning to despair of success, when Solon urged them in an elegiac poem to renew the struggle, and Megara was defeated. In another poem Solon spoke out plainly on the state of Athens. He thus became the foremost man in the city, and in 594 B.C. was chosen archon and reconciler of the state. He began with a strong measure, by which all debts on the security of land and person were entirely cancelled; and for the future it was forbidden to lend money on the security of the person. Solon also reorganized the political constitution of Athens, which provided for representation of all classes on the council. This constitution was the first step to democracy at Athens. But Solon's political arrangement did not last long. Shortly after 600 B.C. we find Attica divided between the nobles, the merchants, and the hill folk of the north. At the head of the last was Pisistratus, a man of noble birth, who, with the help of his democratic following, made himself tyrant of Athens 560 B.C.

For the next fifty years, with some interruptions, Athens was governed by tyrants, first under Pisistratus, who died in 527 B.C., then under his son Hippias. At length, the Alcæonidæ engaged the Delphic oracle to persuade the Spartans to assist them in driving out the tyrant. Sparta became a center to which the cities which had suffered from the oppression of tyrants looked for help, and in the course of the century the Peloponnesian confederacy was formed, with Sparta at the head. She was now recognized as the leading state in Greece. A distinctive feature of this period is the disappearance of the tyrants. But the tyrants did a great

work in Greek political history, breaking the exclusive power of the oligarchs, and raising their cities to a height of power which, in many of them, was never surpassed. Everywhere they favored the people. They established popular festivals, such as the Dionysiac at Athens, and encouraged the national festivals, of which, indeed, they seem to have been, in some cases, the founders. With a true instinct for the genius of their nation, they fostered the development of art, plastic and poetic. There was, of course, another side to the picture. Many of them used their power for the worst purposes, and trampled on all law in the gratification of sensuality and greed. The period of their rule was regarded as an enslavement of the city, and the tyrannicide was held in honor as one who had liberated his fellow-citizens and avenged their wrongs.

The 5th century in the history of Greece comprises three great events—the Persian war, the rise of the Athenian empire, and the Peloponnesian war. Athens now became beyond question the foremost state in Greece, but her rise to power created bitter jealousies. Greece, which seemed to be united in opposition to an invader, became sharply divided—Dorian against Ionian, the Peloponnesus against Athens, and democracy against oligarchy. Quite at the beginning of the century the Ionians in Asia revolted from the 'great king,' and Athens, as an Ionian city, was drawn into the conflict. When the revolt had been suppressed, a Persian army and fleet were dispatched but the fleet was wrecked in a storm, while the land force was severely defeated by the natives of Thrace. Two years later, 490 B.C., Darius equipped another force. The Athenians, supported by the Platæans only, engaged with the Persian army, and were successful, driving the enemy to their ships with great slaughter. A second attempt to punish the Athenians and subjugate Greece ended, like the first, in failure, 490 B.C.

In the spring of 480 B.C., Xerxes, the son of Darius, appeared at the Hellespont, with an army and fleet larger than had ever been seen before. The Greeks meanwhile were in the greatest alarm. Even Delphi wavered, and when the oracle was consulted by the Athenians, the response was far from encouraging. The Athenians determined on resistance. Troops were sent under the command of Leonidas, the Spartan king, to Thermopylæ, and ships to Artemisium. On land the Persians were unable to force a way through

the pass, till, owing to the treachery of Ephialtes they got behind the Greeks, who were surrounded and cut down. At sea the Persian fleet suffered severely from a storm and the remaining ships were defeated by the Greeks. The Persians were severely defeated, and Xerxes, who had entered Attica and occupied Athens, determined to retreat, leaving Mardonius behind to renew the invasion in the following spring. Mardonius retired to Thessaly for the winter. In the spring of 479 he again marched south, and, after devastating Attica and Athens more completely than before, retired upon Thebes. The Greeks followed him, and the battle of Plataea was fought, in which Mardonius was defeated and slain. In the same summer the united Greek fleet sailed across the Ægean to Samos, and defeated the Persian fleet on the opposite promontory of Mycale. Thus by land and sea the Persian power was overthrown.

The Athenians now received into alliance the Ionians and islanders, with whom they sailed to the Hellespont to begin the siege of Sestos. The Delian League was now founded, 477 B.C., by Athens and the allies. The cities who joined were required to furnish ships or 'tribute' towards the formation and maintenance of a common fleet. The league continued for about twenty years, when Athens began to assert her power. At the time of the last Persian invasion, 480, the government of Athens passed mainly into the hands of the Areopagus; but the democratic spirit, which had been growing in the city and which had received a great stimulus from the successes of 490 and 480, found expression in Themistocles and Ephialtes. Themistocles was disliked by the noble families, was got rid of. Ephialtes, a few years later, perished by the hands of an assassin. His place as a leader of the democracy was taken by Pericles. Under the rule of Pericles Athens became the most beautiful city in the world. Pericles was fortunate in having the assistance of the greatest architects and sculptors of his time, among whom Phidias held the leading place; and Athens was now the home of the great dramatic poets, Æschylus, Sophocles, Euripides, Cratinus, and Aristophanes. Thither, too, were attracted philosophers and teachers from all quarters, among them Anaxagoras of Clazomenæ, who exercised a great influence on Pericles.

Meanwhile difficulties arose with the Corinthians about Corcyra and Potidæa. The Megarians also complained loudly of a de-

cree which Pericles had passed, excluding them from the ports in the Athenian empire. Sparta, as head of the Peloponnesian confederacy, declared that the peace of 446-445 had been broken; and Thebes, her ally, seized the opportunity to make an unexpected attack on Plataea, 431. Thus began the Peloponnesian war, which brought all Greece into conflict, and lasted till near the end of the century, with the result that the empire of Athens was destroyed, and Sparta once more became the leading state of Greece. The attempt of Sparta, after her conquest of Athens in 404 B.C., to administer her empire by a series of oligarchies established in the cities, created the greatest dissatisfaction, and it was in vain that she endeavored to fortify her position by declaring war on Persia. In 394 B.C., Athens, with Thebes and Corinth, declared war on her, the Corinthian war. But though the allies were defeated at Nemea and Coronea, the war lingered on for years. Meanwhile the Peloponnesian fleet was severely defeated, 394, by the Persians and ceased to be a power in the Aegean. The war, both in Greece and in Persia, lingered on till 387, when the peace of Antalcidas was concluded. The cities on the Asiatic coast were given up to Persia; the cities in Greece, whether small or great, were to be independent. The carrying out of the terms was left to Sparta, who thus continued to be the leading state. She abused her authority, and her conduct led to the formation of the second Delian League, for protection against her.

At this time Thebes was gaining power. Led by Epaminondas and Pelopidas, she attempted to accomplish the centralization of Boeotia. To this Sparta was violently opposed, and her opposition led in 371 to the battle of Leuctra, in which the Spartans suffered the severest defeat they had ever known. The result was a complete revolution in the Peloponnesus. Sparta's power was broken and Thebes was regarded with hatred even by her old friends. The greatest confusion prevailed. Within a few years important changes took place. In 359 Philip II. ascended the throne of Macedonia. War was declared on him by Athens in 357, and continued till 346, when it was brought to an end by the peace of Philocrates. In 340 war was again declared upon Philip by Athens. Demosthenes did his utmost to combine Greece against him, and with some success: the Athenians and Thebans drew together, and an alliance was formed with Byzantium,

which was saved from Philip. The final conflict came in 338 at Chaeronea. The Greeks were defeated, and Greece passed under the control of Macedon. Sparta remained sullenly aloof, though the liberties of Greece were at stake.

In the autumn of 338 Philip reorganized the Greek world. Sparta excepted, under his supremacy. But in the summer of 336 Philip was struck down by an assassin. The Greeks at once conceived hopes of regaining their freedom, but they were quickly undeceived. In the autumn of the same year Alexander appeared with an army in Greece, and a second congress was summoned at Corinth, at which his supremacy was recognized. Alexander was now able to carry out his great object, the invasion of Persia, for which see ALEXANDER THE GREAT. His conquests made it possible for Greek civilization to penetrate the East as it had never done before. Greek colonies were founded even as far as the Jaxartes. When the news of Alexander's death arrived in Greece, another blow was struck for freedom (Lamian war, 323-322). The rising was crushed at Crannon by Antipater, the Macedonian general. He demanded from Athens the surrender of Demosthenes, who to escape took poison.

The throne of Macedon was occupied by Antigonus Gonatas, 283-239, and his descendants. With the help of Aratus of Sicyon, the Achaean cities in the north of Peloponnesus consolidated and enlarged their ancient league; and as the center of free Greece it was joined by numerous cities—Sicyon, Corinth, Megalopolis, and finally Argos. Between Sparta and the league relations became unfriendly. Sparta was at this time in a state of revolution. In 220 Philip III. succeeded Antigonus as king of Macedon. Three years later he was aiding the Achaeans against the Aetolians when he received the news of Hannibal's victory at Lake Trasimene, 217. He at once put an end to the war with the Aetolians, and prepared to support Hannibal. The Romans retaliated by inciting the Aetolians against him, 211-207. After an interval of peace Rome and Philip were again at war, and the Achaean League joined Rome. The decisive battle was fought at Cynoscephalae in Thessaly, and at the Isthmian games of 196 B.C. it was proclaimed that 'the Roman Senate and Titus Quinctius, having overcome King Philip and the Macedonians, gave liberty to the Corinthians, Phocians, Locrians, Euboeans, Achaeans of Phthia, Magnestae, Thessalians, and Perrhaebians, with exemption from



garrisons and tribute, and permission to govern themselves by their hereditary laws.' This was the end of the Macedonian monarchy.

The Achæan League continued to carry on hostilities with Sparta, in the hope of forcing the city to join them. Sparta appealed to Rome, who sent Mummius with an army to bring the confusion to an end. He took and destroyed Corinth, and the Achæan League was reduced to its original form, 146 B.C. Greece, the northern part as Macedonia, the southern as Achæa, passed into the control of Rome, Achæa being governed by the prætor of Macedonia, which was now constituted a Roman province. The cities were allowed to retain their institutions and laws, but ceased to have any political existence. A period of just and wise administration under the Roman rule ensured prosperity to Greece; its supremacy in thought and letters was acknowledged, and much was done to restore its ancient splendour. During the 3d century A.D. the long-continued tranquillity of the country was broken by the invasion of the Goths, who overran the peninsula and captured Athens, Corinth, Sparta, and other towns. Towards the end of the 3d century Christianity began to spread, although it had to contend with strong opposition.

After the fall of Rome, Greece formed part of the Eastern or Byzantine empire. Byzantine rule practically ceased with the founding of the Latin empire of the East in 1204; but this came to an end in 1261. The peninsula was then divided into a number of feudal fields, of which the duchy of Athens existed longest until Greece was subjugated by the Turks in 1460, although many of the islands remained in Venetian hands till 1718. The Venetians, however, were again ousted in 1715 by the Turks, and by the peace of Passarowitz, 1718, the whole country fell to the Ottoman empire.

Early in the 19th century the spirit of national independence awakened in Greece, and in March, 1821, the standard of revolt was raised at Jassy, Moldavia. The Turks attempted to crush the revolt, but without success, and in January, 1822, the first National Assembly drew up a constitution at Epidaurus. Heroic deeds on the part of the Greeks and continued massacres by the Turks evoked in Europe an intense sympathy with the Hellenic nation, largely influenced by the passionate poetry of Byron. A last desperate effort was made by the Turkish government to overcome the Greeks, and an Egyptian army of some 20,000 men was landed in the

Morea in February, 1825. Within six months the Turks had entire possession, and the Greek cause seemed doomed. But the feeling in Europe had strengthened, and intervention was determined upon. England, France, and Russia, in the London protocol of July 6, 1827, called for an armistice, and at the same time strengthened their naval forces in the Mediterranean. The Porte refused to hear the powers, and the defiant attitude resulted in the decisive battle of Navarino, October 20, in which the combined Turkish and Egyptian fleet was annihilated by that of the allies. The success in 1828-9 of the Russian attack by land on Turkey finally forced the Porte to consent to the dictation of the powers, and by the London protocol of February, 1830, Greece was declared an independent kingdom.

After an unsuccessful attempt to rule by National Assembly, the powers again stepped in: a monarchy was established, and Otho, second son of Louis I. of Bavaria, was placed on the throne. King Otho, however, failed to come into touch with his subjects, and the refusal of a constitution provoked a bloodless revolution, 1843, which compelled the king to yield. A new choice of a king was made in the person of Prince George, the second son of the king of Denmark, who began to reign as George I. The Berlin Congress, 1878, proposed a readjustment of the unsatisfactory boundary between Greece and Turkey, but it was not till 1881 that the compromise offered by the Porte was accepted. By the readjustment Greece received all Thessaly south of the northern watershed of the Salambria, and the country to the boundary of the Arta River. But this arrangement was only accepted by Greece under protest. She claimed Crete as well, regarding that island as a natural Hellenic possession. Dissatisfaction became rampant, and the national passion broke out into a war with Turkey in April, 1897. The Greek army, wholly unprepared, made no determined stand, and after a series of disastrous routs the country was at the mercy of the Turks, and their advance was stopped only by the peremptory demand made by Russia on Turkey for an armistice. On Dec. 4, 1897, a treaty was signed at Constantinople whereby Greece was compelled to pay \$18,000,000, to submit to a rectification of the frontier, and to accept international financial control. Through the intervention of the Powers, however, she suffered little loss of territory. In 1908 Crete proclaimed its union with Greece; but Turkey

steadfastly refused to consent, in which she was supported by the Powers.

The general dissatisfaction with the situation in Greece showed itself particularly in the army, which threatened to usurp entire control. It eventually yielded, however, to the suggestion of a National Assembly, to consider certain much needed constitutional reforms. On Feb. 7, 1911, plans for the reform of the constitution were completed. These reforms were sanctioned by the Revisionary Chamber and were signed by the King June 14, 1911. Early in 1912 Greece joined Bulgaria, Montenegro, and Serbia in an offensive alliance against Turkey. The First Balkan War, which followed, ended with the defeat of Turkey and the signing of the Treaty of London, May 30, 1913. Within a month's time after the signing of peace, Greece was again involved in war, this time in alliance with Serbia (later joined by Roumania and Turkey) against their former ally, Bulgaria. Peace was once more concluded on Aug. 10, 1913. Greece was awarded Thessaly, parts of Macedonia, Epirus, and Thrace, and such of the Aegean Islands as were not occupied by Italy, including the long disputed island of Crete, thus nearly doubling her area and population.

Greece did not formally enter the Great War until 1917 in spite of her treaty obligations to assist Serbia in case of attack. Her history in the interval was that of the struggle between two factions: one, led by the King, demanded strict neutrality; the other, led by Venizelos, desired active intervention on the side of the Allies. Premier Venizelos was dismissed on Oct. 5, 1915, and was followed by a succession of premiers who devoted themselves to the execution of the government's neutrality policy. A commercial blockade, declared by the Allies on June 21, secured the demobilization of the Greek army, the removal of certain pro-German police officials, but the situation failed to improve. More strenuous measures on the part of the Allies becoming imperative, the Greek Navy was taken over by the French, Piræus was occupied, and Allied forces were landed to prevent demonstrations of hostility to the Entente.

King Constantine abdicated on June 12, 1917, and was succeeded by Prince Alexander, his second son. The Greek policy immediately changed. Former Premier Venizelos, who had headed a revolutionary government in Crete since Sept. 25, 1916, assumed control. On June 29 relations were broken with

the Central Powers (see EUROPE, GREAT WAR OF). In 1921-23 Greece was at war with the Turkish Nationals in Asia Minor following Greek occupation of Smyrna and the coast regions, in accordance with the terms of the treaty of Sèvres. After desperate fighting, in which the Greeks were at first victorious, the Nationals were successful, and peace was finally signed at Lausanne in July, 1923.

The republic was established April 13, 1924, as a result of a plebiscite. Following the rise and fall of the Pangalos dictatorship, 1925-26, Venizelos, who had been in retirement, returned as head of the government in July, 1928, and set out to improve the relations of Greece with her neighbors. Treaties of a pacific nature were signed with Italy in 1928, and with Yugoslavia in 1929. In 1930 three separate agreements were signed with Turkey; the first provided for the final liquidation of the exchange of populations between the two countries; the second pertained to commerce and navigation; and the third provided for neutrality of either of the contracting parties in the event of the other being attacked by a third power. A temporary trade agreement with the Soviet Union was signed in Athens in 1933. Venizelos, out of power again, led an uprising in 1935 which proved abortive. The former premier fled. The royalist cause proved its strength by obtaining 287 of the 300 seats in the parliament then elected. A plebiscite was called on the restoration of a constitutional monarch, and the people voted for the return of George II. He returned to Athens Nov. 25, 1935, and reascended the throne.

On Oct. 27, 1940 Italy invaded Greece from Albania. During the winter, the Greeks gradually beat back the Italians and occupied a large part of Albania. In the spring of 1941 Germany came to the assistance of its ally and Greece was quickly overrun despite assistance in men and materials sent by England. Germany organized a puppet government and a government-in-exile was then set up in London. Sabotage and guerrilla warfare prevailed. In 1943 King George went to Cairo, intending to return from exile; but not until 1944, with the aid of England, were the resistance forces, the ELAS (Greek Popular Liberator Army), overcome and the Germans driven out. In 1945 a law was passed, granting amnesty and freedom to the many political and civil war prisoners.

**Greece: Language and Literature.** The Greek language belongs to the Indo-Euro-

pean family of tongues, its closest relations being with the Indian members of the family on the one side and the Italic on the other. Like the other Indo-European languages it is synthetic and inflectional. It is one of the characteristics of Greek that it has preserved its inflections with great distinctness, largely owing to the fact that it did not possess a strong stress-accent. In the inflection of nouns, Greek has retained five only of the original eight cases—the nominative, vocative, accusative, genitive and dative; having lost the ablative (the place of which is taken by the genitive) and the locative and instrumental (supplied by the dative case). It is by the richness of its verb system that Greek is pre-eminently distinguished. It has three voices—a middle, denoting action as affecting the agent, as well as the active and passive.

The distinctive mark of the language is the number and variety of its vowel sounds; and among them the more musical vowels *a*, *e*, *o* predominate as compared with the thinner sounds of *i* and *u*. Roughly, it may be said that the vowels exceed the consonants in the proportion of 50 per cent.; in English the opposite ratio holds good. Combinations of the vowels give a great variety of diphthongs. The only consonants which end a word in Greek are *v*, *p*, *σ* and *ξ* (*n*, *r*, *s*, and *x*). The resulting lightness of termination is another great factor in the euphony of the language. The original alphabet was, no doubt, adopted from the Phœnicians, though the recent discoveries of a Cretan script at Cnossus and elsewhere make it not impossible that the primary invention of the alphabet was due to the Mycenæans, who imparted it to the Phœnicians, who in their turn passed it on to the Greeks. The oldest specimens of Greek writing known date only from the 7th century B.C. The Phœnician alphabet, with the addition of the vowel *v*, continued in use in W. Greece down to the 5th century B.C., was adopted by Latin, and through Latin became the model of all the alphabets of W. Europe.

The question of the pronunciation of ancient Greek has been much disputed, chiefly because that of modern Greek in many respects differs entirely from what all the evidences of the ancient languages lead us to expect. The scholars of modern Greece unite, however, in maintaining that their pronunciation is the same as that of the ancients. The accent was one of pitch, not of stress; otherwise the distinction of quantity between short and long syllables, so clearly marked

not only in Greek poetry but also in prose, must necessarily have been obscured. In regard to vocabulary, Greek is distinguished above all other languages by its absolute purity and by its wealth of words. It was the Attic dialect which, by reason of the literary predominance of Athens, became the standard form of Greek speech—the form learned by Romans and other foreigners, and taught in modern schools. But Attic was only one among many dialects of ancient Greece. In historical times dialects are classed in three main groups—Æolic, Doric, and Ionic (including Attic). The vocabulary also is corrupted by the intermixture of words from the many races who had conquered and occupied Greece or associated with its people. Thus, words of Latin, Slavonic, Albanian, Turkish, Italian, French, and even English derivation occur in modern Greek. Since the restoration of Greek independence a strong effort has been made by the literary classes in Greece to replace as far as possible such alien words by their ancient Greek synonyms.

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*Literature.*—The history of the literature of Greece is divided into three periods: from 1000 B.C. to 529 A.D., the date of Justinian's closing of the schools of Athens—the period of ancient Greek literature; from 529 to 1453 A.D., the date of the capture of Constantinople by the Turks—the period of Byzantine literature; and from 1453 A.D. to the present day—the period of modern Greek literature. Of the first period the first seven centuries comprise what is known as the classical literature of Greece. *Epic Poetry.*—The oldest form of literature in Greece is epic poetry. It includes all Greek poetry written in the epic metre, the hexameter, thus including didactic and philosophical poems. The hexameter is pre-eminently adapted to the nature of the Greek language, moving with a freedom and variety which the same meter has attained in no other language. It was probably originally used in hymns to the gods; but there are evidences of the existence

of poets much older than Homer, who himself tells us of Achilles singing 'lays of heroes,' and of famous bards like Demodocus and Phemius. Other evidences of pre-Homeric poems are the names of Orpheus, Linus, Museus, and Thamyris, figures half or wholly mythical, whom the ancient Greeks believed to be the earliest poets of their nation. But the history of Greek epic poetry really begins with Homer, whatever his name represents—whether he was an individual, author of both *Iliad* and *Odyssey*; or whether there were two Homers, one author of the *Iliad*, the other of the *Odyssey*, as seems more probable; or whether the name represents a school of poets, who at different times composed various poems at length collected into their present shape. But the perfection of the Homeric poems points to their marking the end rather than the beginning of an age of development: that age was the so-called Mycenaean. The renown of Homer, and the fame which his poems gave to the story of Troy, called forth a number of imitators: these were the Cyclic poets, whose works completed the tale of Troy, dealing with the portions preceding and succeeding the subjects of the *Iliad* and the *Odyssey*. The earliest of these writers, Stasinus and Arctinus, wrote probably in the 8th century B.C.

To Homer were also attributed the *Margites*, a satirical poem dating c. 600 B.C.; an epic burlesque, the *Battle of the Frogs and Mice*, a work of late and uncertain date; and the *Homeric Hymns*, short songs in honor of various gods, intended as the preludes to epic recitations at festivals. Other later epic poets were Pisander of Samos, who wrote on the deeds of Heracles at an unknown date; Panyasis, the uncle of Herodotus, who also wrote a *Heracleia*, and another poem called *Ionica*. These writers flourished in the 5th century B.C. Of later epic poets in the strict sense, Apollonius Rhodius with his *Argonautica*, the first poem of which love is the main subject, takes the lead; he flourished between 250 and 200 B.C. Finally, the lamp of epic poetry flickered out in the persons of Quintus Smyrnaeus, 400 A.D.; Musaeus, who wrote on Hero and Leander; and Nonnus, a Christian writer. The last two date about 500 A.D.

Earlier, however, than all these poets save Homer was Hesiod, whom, indeed, the ancients regarded as Homer's contemporary. He applied the epic metre and dialect to questions of daily life in his *Works and Days*. He probably lived in the 8th century B.C. In the 6th century B.C., Xenophanes, the founder of

the Eleatic philosophy, expounded his views in forcible verse, as did his successor Parmenides (c. 500 B.C.). A much greater poet was Empedocles, also a philosopher, who lived during most of the 5th century B.C.

**Lyric Poetry.**—Lyric poets have been taken as including elegiac, iambic, and lyric writers properly so called. In Greece lyrics of a purely personal character were less prominent than public lyrics, songs written to be sung at festivals and other occasions by large choruses to the accompaniment of dance and music. In date the elegiac poets precede. Their metre, the elegiac couplet, consisted of a full hexameter, followed by a shorter one, the pentameter, docked of two long syllables, thus forming a sort of stanza suited for the expression of pointed thoughts. The invention of the meter is assigned to Archilochus of Paros, c. 700 B.C., as is also that of the iambic. Callinus of Ephesus, c. 720 B.C., was, however, probably an older poet. He exhorted his countrymen to battle in manly strains, which were closely imitated by Tyrtaeus of Athens and Sparta, c. 650 B.C. Mimnermus of Colophon represents a different school: his poems treat of life and love with a resigned melancholy. Solon of Athens, again, 638-558 B.C., used the elegy to expound his political opinions. Phocylides of Miletus, fl. 520 B.C., was famous for his epigrams, and celebrated epigrams are assigned to writers otherwise renowned, as Aeschylus, Sophocles, Thucydides, Plato, Demosthenes and Aristotle.

Of the iambic or satirical poets only three are of importance: Archilochus, who has been already mentioned; Simonides—more correctly Semonides—of Amorgos, fl. 625 B.C.; and Hipponax of Ephesus, fl. 540 B.C., inventor of the meter called Hipponactean. The lyrical poets proper are far more numerous. First come Terpander of Lesbos, fl. 670 B.C., and Alcman of Sardis, fl. 630 B.C., who both settled at Sparta, and composed lyric poetry of every kind. In point of date Alcæus and Sappho, both of Mitylene, fl. 600 B.C., follow; but their lyrics differ in expressing purely personal passion. As such they have influenced modern lyric poetry more than all other Greeks, though among the Greeks themselves they had little success. Inferior to them in fire was Anacreon of Teos, 560-478 B.C., a singer of the pleasures of love and wine. But the favorite lyric poets of Greece were those who dealt with passions and emotions of a more national and universal character, and whose verses were aided by musi-

cal accompaniment, dancing, and the splendid spectacle of a large chorus on great feast days. Such poets were Arion of Methymna, fl. 600 B.C., the inventor of strophe and antistrophe; Simonides of Ceos, 556-459 B.C., a poet of great range; Bacchylides of Ceos, c. 510-450 B.C.; and, above all, Pindar of Thebes, 521-441 B.C., in Greek estimation the greatest of the lyric poets.

**Dramatic Poetry.**—It is the peculiar glory of the Greek genius to have invented the drama. It began in the songs sung at rustic festivals in honor of Dionysius. These songs were systematized by Arion; Stesichorus showed how the legends could be told in choric verse; but Thespis of Attica, fl. 550 B.C., invented drama in the true sense when he introduced an actor as distinct from the chorus, whose function it was to act the adventures of the god described in the songs, and to hold dialogues with the leader of the chorus. Thespis introduced masks and costumes which enabled his one actor to take several parts. His successors Cherilus, Pratinas, and Phrynichus, all fl. 520-480 B.C., the last named famous for the first historical play, the *Capture of Miletus*, followed in the same lines. It was Æschylus, 525-456 B.C., who gave its final form to drama by introducing a second actor, thus making the chorus subordinate, and by inventing scenery and stage appliances. A third actor was added by Sophocles, 497-406 or 405 B.C., while Euripides, 480-407 or 406 B.C., made the drama more realistic. These were the three great geniuses of the Attic drama; Æschylus famous for his majesty of thought and language and his deep religious feeling; Sophocles for his perfection in the presentation of his character and in diction, and his genuine Hellenic restraint of tone; Euripides for his naturalness and pathos. After 300 B.C. the tragic drama languished; only plays for reading, like those of Lycophron, fl. 295 B.C., of Alexandria, were composed. The comic drama had come into life practically at the same time and with the same origin as tragedy; it arose from the practice of indulging in scurrilous abuse at rustic festivals.

Attic comedy falls into three stages—Old, Middle, and New. Of these the Old is the most important. It flourished from 460 to 400 B.C.; its characteristics are violent attacks on individuals, mingled with much brilliant wit, word-play, parody, and coarseness. Magnes, Crates, Cratinus, Pherecrates, and Eupolis are among the names mentioned as comic poets; but all are overshadowed by

Aristophanes, c. 450-386 B.C., whose vigor, imagination, force of satire, and purity of language have never been surpassed. The Middle comedy, dating from 400-335 B.C., differed mainly from the Old in its lack of personal satire. It was a comedy of character and types, of travesty of religious myths, and of parody of tragic plays. Antiphanes, 404-330 B.C., and Alexis, 390-284 B.C., were the chief writers. The New comedy, which dates from 335-270 B.C., is a comedy of domestic manners and of social life. Imitated by the Latin comedians, it has furnished the model for modern comedy in all languages. The most famous names are those of Philemon, Apollodorus, Diphilus, and, above all, of Menander, 342-290 B.C., the loss of whose works is one of the greatest suffered by Greek literature.

**Alexandrian Poetry.**—By 300 B.C. the national life of Greece was practically dead; literature lost its natural inspiration. A new age began, devoted to the study of the literature of the past. Of this group Apollonius Rhodius, Aratus, and Lycophron have been mentioned. Others were Philetas of Cos, c. 340-283 B.C., a writer of love poems in elegiacs; Callimachus of Cyrene, c. 310-235 B.C., who wrote hymns and epigrams, and Herondas, the author of a mime, the recent recovery of which in a papyrus found in Egypt widens our view of ancient literature. Far more important than any of these is Theocritus of Syracuse, fl. 272 B.C., who lived for some years at Alexandria. Though a poet of learning like the rest, he opened a new vein in his exquisite idylls of shepherd life in Sicily, and in his fifteenth idyll, descriptive of social life at Alexandria. After the time of Theocritus no great work was produced in Greek poetry; but the Greek anthology contains a vast number of short pieces, from two to some twenty or thirty lines in length, on a great variety of subjects. Some of these epigrams are of the greatest delicacy, both of thought and expression, and reflect most clearly the chief excellences of Greek literary art. Among the numerous authors are Leonidas of Tarentum, Antipater of Sidon, and Meleager of Gadara, who began the collection so-called, and lastly, Agathias, who may be called the last voice of ancient Greek poetry.

**Prose Literature.**—The earliest prose writers of Greece, such as Pherecydes of Syros, Cadmus of Miletus, and Charon of Miletus, all dating from the 6th or early 5th century B.C., were chroniclers, of whose works only a few fragments remain, and of whom little is

known. Hecataeus of Miletus, c. 550-480 B.C., is a more distinct figure. Better than Herodotus he deserves the title of 'father of history'; but his works are lost. Herodotus of Halicarnassus, c. 490-420 B.C., is the first great Greek historian. Hellanicus of Mitylene was a younger contemporary of his. His chief work, not now extant, was a history of Attica. In the same period Ion of Chios and Stesimbrotus of Thasos wrote the earliest known memoirs of public men. All the writers above mentioned wrote in the Ionic dialect, in a style unaffected by art, though possibly, as in the case of Herodotus, highly artistic in their simplicity. Early in the 5th century B.C., however, a school of rhetoric had arisen in Sicily, headed by Corax and Tisias, and developed by Gorgias of Leon-tini, 490-390 B.C., who first used a variety of rhetorical figures, and consciously aimed at composing artistic prose. His influence strongly affected Attic writers, especially Thucydides, c. 471-400 B.C., the first of Attic historians both in date and rank, and the first of critical historians. His *History of the Peloponnesian War* is the greatest historical work of antiquity. Xenophon, c. 429-355 B.C., continued the history of Thucydides, which was left unfinished, and wrote various other short historical pieces. Compared with Thucydides, his work fails in elevation both of style and thought, and is disfigured by a strong Spartan bias. Timæus of Sicily, 352-256 B.C., wrote a Sicilian history notable for its thoroughness of research. Outside the classical period fall Euhemerus, c. 300 B.C., who explained divine legends by the theory that the gods were mortal men, worshipped after their death; Polybius, 205-123 B.C., the historian of Rome; Diodorus, fl. 30 B.C., author of a universal history; Plutarch 46-120 A.D., the author of the *Lives of Famous Greeks and Romans*; Apian, fl. 160 A.D., who wrote on Roman history. For the modern world Greek historical literature is contained in Herodotus, Thucydides, Xenophon, Polybius, and Plutarch.

The practice of oratory among the ancient Greeks arose from the necessities of the law court and the public assembly in democratic states: thus it is said that Corax and Tisias, already mentioned, found scope for their art in the many litigations caused by the expulsion of the tyrants from Sicily about 460 B.C. About the same period arose the Sophists, who professed to be general educators of mankind, but who in practice turned their chief attention to rhetoric. Famous Sophists,

such as Gorgias, Protagoras, Prodicus, Thrasymachus, and others, greatly developed the rhetorical art. It was particularly at Athens, the chief democratic state of Greece, that eloquence was of importance; and in Greek literature only the ten Attic orators—the classification is due to the Alexandrian critics—need to be considered. The earliest of these is Antiphon, c. 480-411 B.C., who was not a speaker himself, but wrote speeches for others. He was followed by Andocides, fl. 410 B.C., a natural orator rather than a rhetorician; Lysias, fl. 400 B.C., a speech-writer, famous for his easy grace of style; Isæus, fl. 360 B.C., a close and careful reasoner; and Isocrates, 436-337 B.C., whose works exhibit the climax of the rhetorical development of Greek prose style. Æschines, 380-314 B.C., was a much more powerful orator, whose effects were due to nature rather than art. His rival, Demosthenes, 384-322 B.C., was the greatest orator of Greece. In him, of all orators, natural genius and painstaking study were harmoniously and fully combined.

Philosophical speculation and historical inquiry both arose in ancient Greece about the same period—the earlier half of the 6th century B.C.; but from the literary aspect, no philosopher before Plato is of importance. Enough is known of the doctrines of Thales, Anaximander, and Anaximenes, all of Miletus, fl. 600-550 B.C., of Pythagoras, fl. 530, of Heraclitus of Ephesus, fl. 500, of Anaxagoras, fl. 450, and of Democritus, fl. 400, to give them importance in a history of philosophy; but their writings have ceased to exist except in scanty fragments. Some works, however, which can be safely ascribed to Hippocrates of Cos, c. 460-400, are extant, and though they are medical, their terse and forcible style gives them rank as literature. Socrates, the greatest thinker of Greece, and the founder of moral philosophy, only taught by word of mouth. But he inspired many disciples—as, for example, Euclides of Megara, and Antisthenes the Cynic, of Athens, who were all active in the earlier half of the 4th century B.C. But the greatest by far of the Socratics was Plato, 420-348 B.C., of Athens, whose works excel all other philosophical writings in literary quality. Aristotle, 384-322 B.C., of Stagira, was the pupil of Plato, and the only other old Greek philosopher whose writings exist in anything like completeness.

Theophrastus, 327-287 B.C., the successor of Aristotle, is known best by an extant work on *Characters*. Of the other great philosophers, Zeno, Cleanthes, and Chrysippus, the



A GRECIAN POTTER  
From a Painting by Paul Thumann

Stoics, and Epicurus, no complete works remain. Only the works of Epictetus and the *Meditations* of Marcus Aurelius require mention, until we come to the time of the Neoplatonists, Plotinus, Iamblichus, and Porphyrius, in whom Greek philosophy degenerated into mysticism, and whose writings are devoid of literary quality. Diogenes Laertius, fl. 200 A.D., may be mentioned under this head, as his *Lives of the Philosophers* contains much valuable information about many of those named in this section.

**Miscellaneous Literature.**—The great literary prose of Greece, with one or two exceptions, has been treated in the three preceding sections; but after the decay of original creative genius, there succeeded generation after generation of scholars, who did much to collect and systematize knowledge of the past. Preeminent among these were the schools of Alexandria and Pergamon, under the patronage respectively of the Ptolemies and the Attalids. But neither school produced much that can properly be classed as literature. Mention, however, should also be made of the Greek romances, the forerunners of the modern novel. Xenophon of Ephesus, fl. 250 A.D., Heliodorus, Longus, both fl. c. 400 B.C., and Achilles Tatius, fl. 500 A.D., are the four chief novelists whose work survives. This last new spring of Greek literature was choked, like all its other founts, by 'barbarism' and Christian intolerance.

With regard to ancient Greek literature, it must be remembered that, considerable as are its extant remains, far more has been lost. Of ancient epic poetry, Homer alone exists; of the lyric poets, only Theognis, Pindar, and Bacchylides present complete poems; of the tragic dramatists we have only thirty-three plays out of three hundred composed by the three great writers, and none of the many other tragedians; the eleven plays of Aristophanes alone exist of the hundreds, or possibly thousands, produced by the many writers of the Old, Middle, and New comedy; most of the poetry of the Alexandrian age is gone; Herodotus, Thucydides, Xenophon, and Polybius are but four of many Greek historians; oratory is better represented; but philosophy can only show the works of Plato and Aristotle out of the hundreds written by philosophers of every school; and of the many productions of ancient scholarship not one in a hundred survives. The vast quantity of the ancient stores is shown by the fact that in the 1st century B.C. the Alexandrian library is said to have contained 700,

000 volumes, while that of Pergamon contained 200,000. The loss of the writings of Archilochus, Alcæus, Sappho, Simonides, and Menander cannot be estimated.

**Modern Greek Literature.**—Except a few popular songs, nothing that can be called literature existed in modern Greek before 1200 A.D., nor can it be said that there had been many works of note composed until the 19th century. From about 1600 there dates another epic, the *Erotokritos*, by Vincenzo Cornaro of Crete. About the same time Georgios Chortakis, also of Crete, wrote a drama, the *Erophile*. Other notable poets are Rhegas Christopoulos, two brothers, Panagiotes, Alexander, and Soutzos. There are many other later poets, such as Angelos Vlachos and Achilles Paraschos, both dramatists. In prose literature the chief names are those of A. R. Rhangabé, 1810-92, who composed works on grammar, history, art, and literature, as well as novels and histories; Tricoupis, the historian of the revolution; the novelist Stephanos Xenos; and the writers of short stories, Bikelas and Psichari. Many modern Greek authors have preferred to compose their works in French, German, or English, to reach a wider audience. Of those who write in modern Greek, the prose authors and some of the poets adopt the literary language, while the poets on the whole prefer the vernacular, the spoken language of the people.

See Mure's (1860, Mahaffy's (1895), and Jevon's (1886) *Hist. of Greek Literature*; Symonds's *Studies of Greek Poets* (1893); Haigh's *Tragic Drama of the Greeks* (1896); Geldart's *Modern Greek Language* (1870), and Felton's *Selections from Modern Greek Writers* (1857).

**Greek Church.** Under the name of the Greek Church are classed a group of churches which, adhering to the decrees of the first seven Œcumenical Councils, do not acknowledge the Bishop of Rome's supremacy. The term 'Greek' merely recalls the early history of these churches, and is inappropriate for a body of which hardly two per cent. are Greeks, or use the Greek language in their liturgy. They themselves use the title of the 'Oriental Orthodox Church,' or, more fully, the 'Holy Oriental Orthodox Catholic Apostolic Church.'

The separations of the Latin and Greek Churches may be traced to the founding of Constantinople and the political division of the Roman empire. Already in 484 we note an estrangement between the Latin and



Greek Churches. It was not, however, until the 9th century that the 'great schism' began. Ignatius, patriarch of Constantinople, had been deposed, and was succeeded by the learned Photius, who convoked a synod at Constantinople, and passed sentence of excommunication on the bishop of Rome. He denounced as heresy the Latin addition to the creed of the phrase *Filioque*, as also the Saturday fast of the Romans, their use of milk and cheese at the great fasts, and their prohibition of priestly marriage. But Photius was deposed, 869, and Ignatius restored by Basil, the new emperor, and a temporary peace was concluded. In 878 Ignatius died, and Photius, resuming the patriarchate, once more excommunicated the Romans. Eight years afterwards he was again deposed, and died in 891, and the churches were reunited until the middle of the 11th century. In the meantime Russia had been converted and added to the Greek Church. In 1054 Michael Cerularius, patriarch of Constantinople, renewed the condemnation of the Latins for their special practices, and was in turn excommunicated by Pope Leo. ix. Michael at once withdrew the Eastern bishops from communion with Rome, and the schism was reopened. The pressure of the Turks induced the Greeks to favor reunion, and efforts were made in 1098, 1168, and 1201, but they were violently opposed by the mass of the Greek clergy and people. At the council of Lyons in 1274 a partial union was effected, but it only lasted six years, and at Ferrara, 1439, the Greek prelates again signed a degree of union, but were forced by the people and clergy to repudiate it.

The Russian Church was founded when, in 1582-9, the patriarch of Constantinople instituted a patriarch of Moscow, who was recognized by all the Easterns as the fifth patriarch of the Orthodox Church. Its independence was completed by the constitution of the permanent Holy Synod in 1721. In 1833 the Greek bishops in turn declared their independence of Constantinople, and organized a permanent Holy Synod, like that of Russia, which was recognized by the patriarch of Constantinople in 1850. In 1870 the Bulgarians formed themselves into a separate patriarchate. These various branches of the Eastern Church are one in their attachment to dogma as defined by the first seven councils, and their resistance to Western innovations. Pope Pius ix. made several fruitless attempts to secure a reunion, and the Vatican decrees

of 1870 intensified the aversion of the Orientals.

In each branch of the Oriental Church the higher clergy consist of patriarchs, archbishops, and bishops. The bishops appoint the lower clergy. Celibacy is obligatory for the higher clergy. In Greece the synod is composed of a bishop-resident and four other elected archbishops or bishops, and is independent of the state. In Russia the Czar was head of the church, and political motives entered largely into its work. The Orthodox Oriental Church celebrates a special festival at the beginning of Lent as 'Orthodox Sunday.' The difference from Rome in respect of belief is mainly one of development. The only point on which there is emphatic disagreement is the manner of the procession of the Holy Ghost. The Greeks maintain that He proceeds from the Father alone, and their dislike to the Latin addition of the phrase *Filioque* ('and from the Son') to the Nicene Creed has ever been the chief obstacle to reunion. Apart from this, and the primacy and infallibility of the Pope, they agree with the Roman Catholic Church in doctrine.

The cult of the Orthodox Church is even more elaborate, gorgeous, and symbolical than that of the Church of Rome. The daily mass is the chief function, and for this they use the ancient liturgy of St. Chrysostom, with an occasional change to that of St. Basil. They practise auricular confession, but the institution has not the importance that it has in the Latin Church. They have the worship of the saints and their relics, but statues, crucifixes, and all images in relief are forbidden; the cross and the picture only are allowed in the cult. They fast on Wednesdays and Fridays, and on the great fasts they abstain from fish, eggs, milk, cheese, wine, beer, and oil, as well as meat. The use of organs or musical instruments is forbidden. In the United States, Eastern Orthodox churches have a membership of about 260,000. See Dean Stanley's *Lectures on the Hist. of the Eastern Church* (new ed. 1883); Howard's *The Schism between the Oriental and Western Churches* (1892); Horton's *Student's Hist. of the Greek Church* (1902).

**Greek Fire** was invented in the year 668 by Callinicus of Heliopolis. That it was a liquid composition we are led by Gibbon to infer from the various modes of using it, whilst other writers describe it as a solid substance. It was chiefly employed on board ship, and was thrown by large engines on the

enemy, or poured over the walls of a besieged place.

**Greek Letter Fraternities or Societies.** See **Fraternities, College.**

**Greeley, city, Colo.,** county seat of Weld co. Settled (1870) by the Greeley colony from New England which was promoted and encouraged by Horace Greeley. The country around, developed by an ideal system of irrigation, produces potatoes, live-stock, alfalfa, wheat, etc., and has deposits of coal; p. 15, 995.

**Greeley, Horace** (1811-72), distinguished American journalist, was born in Amherst, N. H. In 1833, with Francis V. Story and H. D. Shepard, he founded the short-lived *Morning Post*, and in 1834 the *New Yorker*, a well-edited literary paper. He also conducted (1838-39) the *Jeffersonian*, a political weekly, published at Albany, and (in 1840) the *Log Cabin*, a weekly which supported Harrison. He next founded the *Daily Tribune* (1841), to be followed by the *Weekly Tribune*, formed by merging the *New Yorker* and the *Log Cabin*, and destined to become a paper of great influence. In 1860 he was a delegate from Oregon to the Republican National Convention, and strongly favored the nomination of Mr. Lincoln. On the question of secession he held that any state, a majority of whose citizens should deliberately decide to retire from the Union, should be permitted to do so, but maintained that this was not the position of a majority of the South, and he supported the government in the struggle that followed. The war over, he urged general amnesty and universal suffrage; protested vehemently against the prolonged imprisonment of Jefferson Davis, and was one of the signers of the bail bond for Davis's release, an act for which he was bitterly criticized.

He opposed the renomination of President Grant in 1872, and accepted the presidential nomination of 'Liberal Republicans' and the indorsement of the Democrats, but was defeated. He died in the interval between the election and the casting of the electoral votes, on Nov. 29, 1872. Mr. Greeley was a sturdy and resourceful advocate of any cause he espoused, and a brilliant and powerful writer. His place was in the first rank of the group of truly great American editors who have disappeared and whose places have never been filled. His published works include: *Hints Toward Reforms* (1850); *Overland Journey to San Francisco* (1860); *The American Conflict* (1864-66); *What I Know of Farming*

(1871). Consult the biographies by Parton (Boston, 1872); by Reavis (New York, 1872); by Ingersoll (Chicago, 1873), and by Zabriskie (New York, 1890).

**Greeley, Adolphus Washington** (1844-1935), U. S. meteorologist and Arctic explorer, born at Newburyport, Mass. In 1881 he was selected to command the American Arctic expedition, which in conjunction with twelve others formed a circumpolar chain of scientific stations for meteorological and other observations. The expedition penetrated to the then farthest N. lat. of 83° 21' (Brainerd and Lockwood), crossing Grinnell Land. For his services to science, Greeley was honored by various scientific bodies, and was made a captain in the United States army. In 1887-1906 he was chief signal officer of the army; major-general 1906. He published *Three Years of Arctic Service* (1885); *Proceedings of the Lady Franklin Bay Expedition* (1888); *Handbook of Arctic Discoveries* (1896); *Handbook of Polar Discoveries* (1909); *Handbook of Alaska* (1909); *True Tales of Arctic Heroism* (1912); *Polar Regions in the Twentieth Century*, etc.

**Green,** a color of the spectrum between the yellow and blue. It is produced artificially by a mixture of yellow and blue pigments. Important green mineral pigments are copper green and chrome green. The green vegetable and animal pigments have been almost entirely replaced by coal-tar derivatives.

**Green, Andrew Haswell** (1820-1903), American lawyer, financier and philanthropist, was born in Worcester, Mass. He was president of the New York City Board of Education in 1856 and from 1871 to 1876 was comptroller of the city, re-establishing its credit, which had been greatly injured by the Tweed ring thefts. His plan for a 'Greater New York,' proposed in 1868, was accepted in substance in 1897. He formulated the plan for the New York Public Library, founded the New York Zoological Society, and had an important part in establishing the Metropolitan Museum of Natural History, all in New York City. Through mistaken identity he was assassinated by a demented negro.

**Green, Anna Katharine.** See **Rohlfes, Anna Katharine.**

**Green, Bartholomew** (1666-1732), American publisher, was born in Cambridge, Mass. He printed (1704), and afterward became proprietor of the *Boston News Letter*, the first newspaper to be published in the colonies, which under his editorship became famous for its fearlessness and originality in

discussing political and religious questions.

**Green, Duff** (1791-1875), American journalist, was born in Woodford co., Ky. He served in the War of 1812 and thereafter lived in Missouri, took part in framing that State's constitution, and was elected to its Senate (1823). He edited the St. Louis *Enquirer* for a short time, and then went to Washington, D. C. (1825), where he bought the *United States Telegraph*. This paper became the administration organ after Jackson's election, and Green was a member of the President's famous 'Kitchen Cabinet.'

**Green, Hetty Howland Robinson** (1835-1916), American capitalist, was born in New Bedford, Mass. She became widely known for her great wealth, for her shrewdness as an investor, and for her personal peculiarities, which gave rise to many newspaper anecdotes. She married Edward H. Green in 1867.

**Green, John Richard** (1837-83), English historian, was born in Oxford. In 1877 he married Alice Stopford, who aided him in his subsequent work and who was herself an historian of note. Green's *Short History of the English People* appeared first in 1874. A larger independent edition—*A History of the English People*—was published in 1877-80 (4 vols.), and was followed, in spite of the author's continued ill-health, by *The Making of England* (1881) and *The Conquest of England*, completed by his wife after his death (1883). He wrote also other historical works and essays. The Oxford Historical Society and *English Historical Review* owed their inception to him.

**Green, Seth** (1817-88), American pisciculturist, was born in Rochester, N. Y., and having carried out numerous experiments in the artificial propagation of fish, was able to stock the Connecticut, Hudson, Potomac, Susquehanna and many other rivers with salmon, trout, and shad. The last named fish he also introduced into Pacific waters. He published *Trout Culture* (1870) and *Fish Hatching and Fish Catching* (1879).

**Green, Thomas Hill** (1836-82), English philosopher, was born in Birkin, a Yorkshire village. He was educated at Oxford, and was in 1878 appointed Whyte professor of moral philosophy there. It is by his *Prolegomena* and by his searching introductions to the two volumes of an edition of *Hume's Treatise on Human Nature* (1874) that he is best known.

**Green, William** (1873- ), American labor leader, born in Ohio, worked in the coal

mines and gave up studying for the Baptist ministry to join in the unions' struggle for better conditions. At thirty-three, he was president of the Ohio district of the United Mine Workers of America. He succeeded Samuel Gompers as president of the American Federation of Labor in 1925.

To the radical new generation in the rank and file of labor, Green seemed a conservative, like Gompers, but he retained his leadership through the dark days following the 1929 industrial depression. He supported President Franklin D. Roosevelt's New Deal. In 1935 occurred the great split in the ranks of organized labor when the C. I. O. was formed under leadership of John L. Lewis. Green continued to head the A. F. of L., and President Roosevelt's efforts, early 1939, to make peace between these groups, were futile.

**Greenaway, Kate** (1846-1901), English illustrator, designer, and verse writer, celebrated for the charming freshness and originality of her drawings of children. She was born in London, and her earliest work appeared in *Little Folks* (1873). *Under the Window* was published in 1879, followed by *A Birthday Book for Children*, *Mother Goose*, *Little Ann*, and other children's books.

**Greenback Party**, a political party in the United States which sprang up as a result of financial difficulties following the Civil War. In 1876 the party nominated Peter Cooper of New York for president and Samuel Cary of Ohio for vice-president and they received a popular vote of 81,737. The party's theory of money, i.e. that it is determined by fiat of the government, had a great influence on politics and parties, but the greenbackers were never able to elect their candidates and in 1888 passed into history.

**Greenbacks**, a form of paper money, printed on one side in green ink, issued by the United States at the time of the Civil War, based on the credit of the country and not secured by gold or silver on deposit.

**Green Bay**, a portion of Lake Michigan, lying in Wisconsin. It is about 100 m. long, and its maximum width is 20 m.

**Green Bay**, city, Wisconsin, county seat of Brown co., at the head of Green Bay. The city has a fine harbor, which can receive the largest steamers. Rail and water transportation has made Green Bay one of the largest jobbing centers in the State. Green Bay was the first permanent settlement in Wisconsin (1745). Before that time, the site of the city had been a trading rendezvous for French and

Indians, Father Allouez having established a mission here as early as 1669. In 1761 the English built Fort Edward Augustus, surrendered in 1796 to the United States; p. 46, 235.

**Greenbriar**, the name of two American species of *Smilax*—*S. rotundifolia* and *S. lanceolata*. See *SMILAX*.

**Greenbrier Mountains**, a mountain ridge in West Virginia, running parallel with the Alleghany Mountains, through Pocahontas co., about 5 m. w. of Greenbrier River. The summit, Greenbrier, is 3,500 ft. high. White Sulphur Springs nearby is a fashionable resort.

**Greenbrier River**, West Virginia, rises in the Alleghany Mountains. Its course between the Alleghany Mountains and Greenbrier Ridge is through a picturesque valley. Length, about 175 m.

**Greencastle**, city, Indiana, county seat of Putnam co. Greencastle is the seat of De Pauw University (M.E.), and has a Carnegie Library. The place was settled in 1820. p. 4872.

**Greene, Francis Vinton** (1850-1921), American soldier, was born in Providence, R. I. He resigned from the army in 1886, but served in the Philippines during the Spanish-American War, and was made a major-general. He retired in 1899, and in 1903-4 was police commissioner of New York City. He wrote *The Russian Army and Its Campaigns in Turkey* (2 vols. 1879); *Army Life in Russia* (1881); *Our First Year in the Great War* (1918), etc.

**Greene, George Sears** (1801-99), American soldier and civil engineer, father of Gen. Francis V. Green, was born in Warwick, R. I., and was graduated from West Point in 1823. He was connected with the Croton Aqueduct department of New York City, built the reservoir in Central Park there, and enlarged High Bridge. In an engagement near Chattanooga (Oct. 28, 1863) he was wounded, but later served with General Sherman's army in North Carolina. In 1867-71 he was chief engineer of the Croton aqueduct, and in 1871-73 he planned the entire sewerage system for Washington, D. C.

**Greene, Nathanael** (1742-86), American soldier, was born at Patowomut, Warwick co., R. I., the son of a Quaker preacher. In 1775 he was appointed brigadier-general, and put in command of the Rhode Island forces dispatched to Boston. At Harlem Heights, his first actual battle, he showed much skill and courage; qualities which he

again displayed in the battles of Trenton and Princeton, at Brandywine. Much against his inclination he accepted the post of quartermaster-general in 1778, and here again proved his general efficiency. He succeeded General Gates in the fall of 1780 in command of the Army of the South, where his most important work was done. He first improved the condition of his much demoralized forces, and then, though forced northward into Virginia by Cornwallis, he re-entered North Carolina, and remained in control of much of that state, and eventually drove the British from Georgia and the Carolinas, excepting three towns on the coast. For his generalship at Eutaw Springs the states concerned gave him grants of valuable land, and Congress presented him a medal. Consult: F. V. Greene *General Nathanael Greene* (New York, 1893) and G. W. Greene, *The Life of Nathanael Greene* (3 vols., New York, 1867-71).

**Greene, Robert** (c. 1560-92), English dramatist and pamphleteer, was born in Norwich. He wrote plays for the Queen's and other companies of actors, and a number of pamphlets, of which the best are in a vein of sentimental romance, and often contain exquisite pastoral and lyric verse. Many of his later writings are semi-autobiographical. One (*Groat's Worth of Wit*) is famous as containing an attack upon the growing dramatic fame of Shakespeare. *Frier Bacon and Frier Bongay* (1594) is the best known of his plays. Collected works: ed. A. Dyce (plays only, 1831, 1861); ed. A. B. Grosart (complete, 15 vols., 1881-86); *Plays and Poems*, ed. Collins (1902). See Life by N. Storojenko (Eng. trans. in Grosart, vol. i.).

**Green Earth**, a common name for glaucous.

**Greenfinch**, or **Green Linnet** (*Ligurinus* or *Coccothraustes chloris*), a common European finch (sub-family *Fringillidae*), which becomes very tame in confinement, and interbreeds both with the canary and the goldfinch.

**Green Frog** (*Rana clamitans*), a frog three to five inches long, found in Eastern North America, variable in color, but having in general the head and shoulders of brilliant green, shading to a dull olive. The green frog is distinguished from the bullfrog, which it otherwise resembles, by folds of skin along its sides.

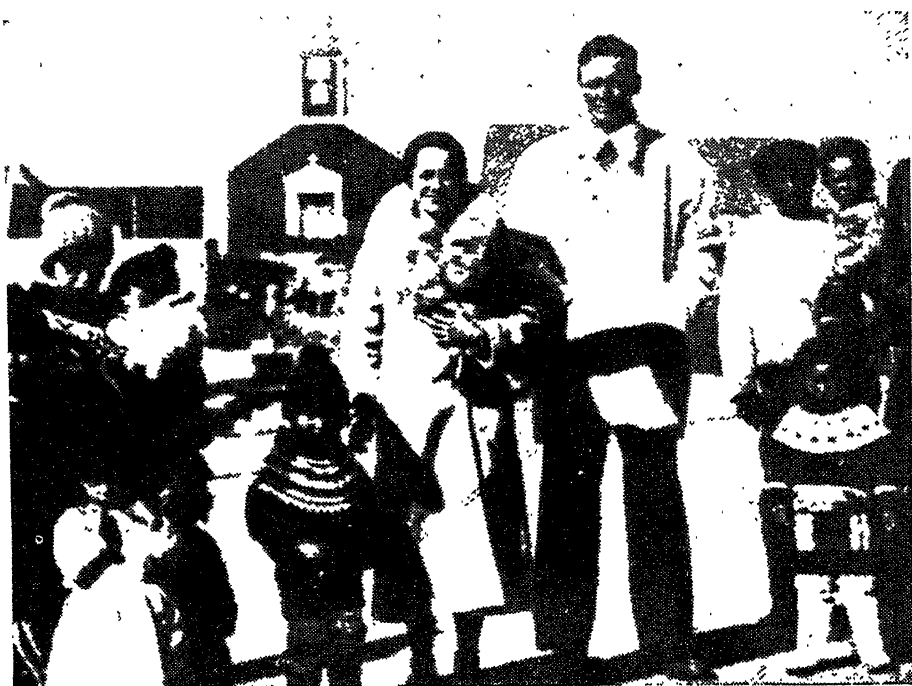
**Greengage**, a medium-sized, round plum, green to yellowish green in color, with reddish brown spots at the base, and pale,

greenish-yellow flesh, of excellent flavor. It ripens about the middle of August. See PLUM.

**Greenheart, Bibiri, or Bebeeru** (*Nectandra Rodiæi*), is a tree of British Guiana, the timber of which is held in high repute for shipbuilding. The bark, known generally as bebeeru or bibiri, yields an alkaloid with tonic and febrifugal properties somewhat similar to those of cinchona.

**Greenhouse**, a term formerly applied only to the glass house with little or no artificial heat, but now used in the United States to designate any house in which plants are

Arctic seas. It is separated from the northeast coast of America by Baffin Bay, Davis Strait, Smith Sound, Kane Basin, Kennedy Channel, and Robeson Channel, and from Iceland on the e. by Denmark Strait. Separated from Greenland proper by this narrow channel lies an island known as Peary Land, generally considered with the main island, which terminates in Cape Morris Jesup, the most northern known land (lat.  $83^{\circ} 39'$ ). Length, n. to s., 1,600 miles; greatest breadth, e. to w., 700 miles; area, about 850,000 sq. miles. The interior is covered with an im-



Greenland: Lindbergh Visit.

grown under glass, except cold frames and hotbeds. Greenhouses are of three types: the even-span house, in which the two slopes of the roof are built at the same angle and of the same width; the three-quarter span, in which the south slope of the roof is prolonged and the north slope correspondingly shortened; and the lean-to, built against a wall or a hillside. Each type is especially adapted to the cultivation of certain products. See GARDENING. Consult Bailey's *Forcing Book* (1909); Taft's *Greenhouse Construction* (1911).

**Greenland**, an island-continent in the

mense shield-shaped mantle of ice, rising from 4,000 to 8,000 ft., which sends out numerous glaciers to the sea. These discharge numberless icebergs, some of which, borne s. by the Labrador current, reach the courses traversed by trans-Atlantic steamships. Many of the glaciers are of great size: Humboldt glacier, facing Kane Basin, is believed to be 60 miles wide. The temperature is arctic.

Iron is found in large masses on the basaltic of Disko Island, and copper and coal in North Greenland; but the only mineral of economic importance is cryolite, which is worked at Ivigtut in the Arsuk fiord. Green-

land birds include the gull, auk, ptarmigan, raven, eider duck, goose, and ring plover. Other animals are reindeer, bears, musk-oxen, foxes, walrus, snow hares, wolves, and seals. There are about 400 species of flowering plants. The habitable coast of Greenland, with the exception of the Cape York region on the northwest, constitutes a Danish dependency, with an area of 46,740 sq. miles. The Danish colonies extend along the w. coast and are grouped into two inspectorates—South Greenland (capital Godthaab), and North Greenland (capital Godhavn). There are about 175 settlements. The trade has been a government monopoly since 1774. Oil of seals, walrus, and whale; skins of reindeer, bear, and fox; feathers and eggs of the eider duck; salt fish, and cryolite are the chief exports; p. 14,355—Eskimos, a large proportion of half-breeds, and a few Danes.

**The true Greenlanders are the Innuits (see Eskimos);** but these have been so much associated for generations with people of Danish stock that pure Eskimos are rather to be found in the less frequented western districts, and of course along the eastern coast and in the extreme n.

**History.**—Greenland was first discovered about 870, according to the *Landnamabok*, by Gunnbjörn. More than a century later another Iclander, Erik the Red, visited the country, naming it Grönland to induce people to settle there. About 986 he founded two colonies at what are now Godthaab and Julianshaab, which must have been subsequently destroyed or absorbed by the Eskimos. In 1721 the missionary Hans Egede landed at the mouth of the Godthaab fiord. De Haven, Kane, Hayes, Hall, Nares, Greely, and Peary successively pushed research farther northward. Nansen crossed from sea to sea in 1888; and Peary in 1892 and 1895 again crossed the ice-cap (5,000-8,000 ft. high) to Independence Bay (81° 40'), ascertaining the insular character of the continent.

In 1898-1902, Peary passed around the northern extremity of Peary Land, and down the e. coast to 83° N. In 1900 Amdrup completed the survey of the southeast coast by traversing the section between 69½° and 67° N. lat.; while in 1905 the Duke of Orleans mapped the general outline of the e. coast to 78° 16', and ascertained the existence of land up to 79°. The Danish Northeast Greenland Expedition (1906-8), under Mylius-Erichsen, devoted itself to detailed exploration between 75° 40' and 83° (about 800 miles). Consult Rafn's *Antiquitates Americanæ* (1837), for

earliest references; Hans Egede's *Greenland*; Greely's *Three Years of Arctic Service*; Nansen's *First Crossing of Greenland*; Peary's *Northward Over the Great Ice* and *The North Pole* (1910); Rasmussen's *People of the Polar North* (1908); Mikkelsen's *Lost in the Arctic* (1913). A Danish possession, Greenland came under U. S. protection in 1941.

**Greenland Sea**, the most westerly of the three branches of the Arctic Ocean, lies between Spitzbergen and Norway on the e. and Greenland on the w. An extensive continental platform skirts the coasts of Greenland and Spitzbergen; but midway between them is a deep basin separated from the Sea of Norway on the s. by the submerged ridge reaching from East Greenland to Jan Mayen, and beyond to Bear Island. A branch of the Gulf Stream passes along the w. coast of Spitzbergen, and a polar current along the e. coast of Greenland carries with it drifting polar ice. See ARCTIC EXPLORATION. Consult Smithsonian Institution's *Report* (1909).

**Greenleaf, Simon** (1783-1853), American jurist, was born in Newburyport, Mass. From 1833 to 1848 he was professor of law at Harvard, when he became professor emeritus. His principal work was the *Treatise on the Law of Evidence* (1853), which has kept its place as a leading authority on that branch of the law.

**Green Mountain Boys** were soldiers of Vermont, organized by Ethan Allen. They took an active part in the American Revolution, and helped defend the Canadian border. See ALLEN, ETHAN.

**Green Mountains**, a collective name for the northern portion of the Appalachian system in Canada, Vermont, Massachusetts, Connecticut, and New York. The name is popularly applied, however, to the mountain range in Vermont, where the peaks are highest. Among these are Mount Mansfield (4,364 ft.), Killington (4,241), Camel's Hump (4,088), and Lincoln (4,078). The geological formation is of metamorphic slate, gneiss, limestone, and sandstone. Marble is extensively quarried, and iron, manganese, and copper are found. The mountains separate the tributaries of the Connecticut River on the e. and those of the Hudson and Lake Champlain on the w.

**Green Mountain State.** Vermont.

**Greenock**, seaport town and parliamentary borough, Renfrewshire, Scotland, on the s. bank of the Clyde River, 22 miles w. of Glasgow. The public buildings include the Renaissance Town Hall (1866), and a six-

teenth-century church with stained-glass windows by William Morris. Shipbuilding is the chief industry. The town is the birthplace of James Watt. John Galt, novelist, and Burns' Highland Mary are buried here; p. 80,200.

**Greenockite** (CdS), a rare compound of sulphur and cadmium, found in Scotland in the form of yellow, pyramidal crystals, and on the Continent and in parts of the United States as a powdery incrustation on zinc-blende. It is made artificially, the corresponding synthetic product being the pigment cadmium yellow.

**Greenough, Horatio** (1805-52), American sculptor, was born in Boston. While at Harvard, where he graduated in 1825, he modelled a bust of Washington from Stuart's portrait, and designed the Bunker Hill Monument. After 1825 he spent most of his life in Italy, but executed for Congress the colossal statue of Washington in front of the Capitol (1843), and a group of four historical figures called *The Rescue*, also placed in Washington, as well as busts of John Quincy Adams, Webster, Clay, and others.

**Green River**, in Wyoming and Utah, the principal tributary of the Colorado River.

**Green River**, a tributary of the Ohio River, rising near the center of Kentucky, and joining the Ohio on its left bank a few miles above Evansville, Ind. Its length is about 300 miles.

**Green Room**, in the theater, the waiting room close to the stage used by actors during intervals; so called from the original color of its walls, green being an antidote of stage glare.

**Greensand**, the name given to sandy or clayey deposits which have a greenish color, due to the presence of glauconite. Such deposits occur in many of the geologic formations, but they are most abundant in the Cretaceous system, where they may be very thick. Along the Atlantic Coast of the United States, three beds, known as the Lower, Middle, and Upper Greensand of the Cretaceous, occur. Greensand is used to some extent as a fertilizer, and is sometimes called marl, or greensand marl.

**Greensboro**, city, North Carolina, county seat of Guilford co. The Battle of Guilford Court House was fought in the vicinity, the battleground now being maintained as a National park by the U. S. Government. The Memorial stadium has a seating capacity of 10,000; p. 59,319.

**Greensburg**, city, Pennsylvania, county

seat of Westmoreland co. Greensburg is in the heart of the gas and bituminous coal and coke districts of the State and has important and varied manufacturing industries. It was settled in 1784-85 and named after Gen. Nathanael Greene. Nearby the Battle of Bushy Run was fought against the Indians in August, 1763. Greensburg was incorporated as a borough in 1799 and as a city in 1928; p. 16,679.

**Greenshank** (*Totanus canescens*), a European sandpiper, distinguished by the greenish color of the legs and feet.

**Greenslet, Ferris** (1875- ), American publisher and author, was born in Glens Falls, N. Y. In 1902 he became associate editor of the *Atlantic Monthly*; in 1907 literary adviser to Houghton, Mifflin & Co., and in 1910 a member of the board of directors. He was elected a member of the National Institute of Arts and Letters. His publications include: *Quest of the Holy Grail* (1902); *Walter Pater* (1903, new ed. 1911); *Life of Lowell* (1905); *Life of Thomas Bailey Aldrich* (1908).

**Green-Stick Fracture**. See **Fracture**.

**Greenstone**, a name formerly given to altered rocks of basic composition, such as diabase and diorite, to describe the dark green color developed in them by the presence of hornblende and chlorite. It has now been largely replaced in scientific literature by more exact names. See **DIORITE**.

**Green Thursday**, another name for Maunday Thursday.

**Green Turtle** (*Chelone mydas*), one of the two species of the genus *chelone*, of the family *Cheloniidae*, found in tropical seas, especially off the island of Ascension, the West Indies, and Nicaragua. These turtles weigh from 50 to 300 pounds, and are caught at night while depositing eggs on the sand. The green turtle is highly prized for soup.

**Greenville**, city, Ohio, county seat of Drake co. Greenville is known as the Treaty City from the fact that two important treaties were arranged here: between the United States and native Indian tribes—one by General Wayne in 1795, and the other by Gen. W. H. Harrison in 1814. Tecumseh and his brother, 'the Prophet,' lived here for a while previous to the War of 1812; p. 7,745.

**Greenwich**, metropolitan borough, London, on the Thames River; 5 miles southeast of London. Greenwich Hospital, now the Royal Naval College, stands on the former site of one of England's chief royal residences, birthplace of Henry VIII., Queen Mary,

and Queen Elizabeth. It was enlarged and beautified by succeeding kings, occupied by Cromwell, and razed by Charles II. During these years tenure of land from the crown was given 'as of the manor of East Greenwich,' an expression which is found in many colonial charters granted in America. The Royal Observatory is situated on a hill in the center of Greenwich Park. The parish church of St. Alphege was the scene of the martyrdom in 1012 of the archbishop of that name. Greenwich is noted for its whitebait, caught in the Thames estuary: p. 100.897.

**Greenwich**, borough, Connecticut, Fairfield co., on Long Island Sound, 28 miles northeast of New York City. It is a summer resort and residential suburb, the home of many distinguished people. Greenwich was settled in 1640 and was part of the New Netherland colony until 1650. In 1656 it submitted to the New Haven colony and in 1662 to Connecticut. On Feb. 25, 1779, Governor Tryon drove General Putnam from Greenwich, where is said to have occurred Putnam's famous ride down a hill so steep that the British did not dare to follow; p. 35,509.

**Greenwich Hospital**, in Greenwich, London, was founded in 1694 by William III. to provide a home for aged sailors and a hospital for the sick and wounded. The buildings, designed by Inigo Jones and Sir Christopher Wren under Charles II., were used for these purposes until an Act of Parliament (1869) substituted for the old plan outdoor relief only for the sailors, and the use of the hospital for a Royal Naval College since 1873.

**Greenwich Observatory**, founded 1675, is situated in Greenwich, England, in lat. 51° 28' 38" N., and is the point through which the first meridian passes, from which longitudes in most civilized countries are measured. Opened in 1676, the observatory sends each day by wire the correct time to the principal towns in the United Kingdom, hence called 'Greenwich time.' Greenwich time was adopted as the standard in the United States in 1884.

**Greenwich Royal Naval College**, a British school of advanced professional education in nautical and kindred subjects at the Royal Hospital, Greenwich, since 1873.

**Greenwood, Frederick** (1830-1909), English journalist and publicist, was early a contributor to *Tait's Magazine* and to the *Cornhill*, of which he became editor in 1862, succeeding Thackeray, and served until 1868. He was first editor of the *Pall Mall Gazette*.

which he originated in February, 1865, and which counted among its contributors Sir Leslie Stephen, Matthew Arnold, and R. H. Hutton. It was Greenwood who first learned that the Suez Canal shares held by the Khedive of Egypt were about to be sold to a French syndicate. After the *Pall Mall* changed owners, he founded the *St. James Gazette* (1880), but retired from the editorship in 1888. Consult Escott's *Masters of English Journalism* (1911).

**Greer, David Hummell** (1844-1919), American Protestant Episcopal prelate, born in Wheeling, W. Va. He became bishop-coadjutor of New York in 1903, and bishop on the death of Henry C. Potter in 1908. He wrote *The Historic Christ* (1890); *From Things to God* (1893); *The Preacher and His Place* (1895); *Visions* (1898).

**Greet, Ben** (1856-1936), English actor-manager, was born on a training ship on the Thames, of which his father was commander. He has been successful as manager and chief actor with road companies both in England and in the U. S., and is especially well known as the producer of the pastoral play and the Shakespearean play without scenery, and in the revival of the morality play *Everyman*. He has published *Shakespeare a Child can Read and Act* (1911).

**Gregale**, a cold, desiccating, unhealthy wind from the northeast, which blows over Malta in spring and early summer.

**Gregarina**, a parasitic protozoon, found within the alimentary canal of various arthropods, such as the lobster, cockroach, and so on. The adult has the single cell which constitutes the body enveloped in a firm articular sheath, and has no mouth, food being apparently absorbed by the whole surface. To the same class (Sporozoa), belong some dangerous parasites of man—e.g., the organism of malaria.

**Grégoire, Henri** (1750-1831), French statesman and ecclesiastic, was born in Vého, near Lunéville. He did much for the cause of education in France, and most of the works of art in Paris which survived the vandalism of the Reign of Terror owe their safety to him. Among his works, which are mainly historical, his *Mémoires* (1837) are of especial interest. Consult the *Lives* by Krüger and Böhringer; Debidour's *L'Abbé Grégoire*; Carnot's *Etude sur l'Abbé Grégoire*.

**Gregorian Calendar**. See **Calendar**.

**Gregorian Chant**. See **Intonation**; **Plain-song**.

**Gregorovius, Ferdinand** (1821-91), Ger-



man historian and poet, was born in Neidenburg, East Prussia. His first work, *Goethe's Wilhelm Meister in seinen sozialistischen Elementen* (1849), attracted some attention. His epic *Euphoriön* (1858) shows a true classical spirit. His chief historical work is *History of Rome in the Middle Ages* (Eng. trans.); while his *Lucrezia Borgia* (Eng. trans.) and *Geschichte der Stadt Athen im Mittelalter* and *Gedichte* (1891) are also noteworthy.

**Gregory**, the name of sixteen popes who held the pontificate at intervals from 590 to 1846. The first was Gregory the Great (590-604), born about 540 at Rome. He was appointed by Justin II. governor of the city (574). After some years spent in retirement, he was elected pope to succeed Pelagius II. (590). Gregory waged war upon the Lombards; administered the estates of the church with ability and equity; developed church music and the ceremonies of public worship; and by his missionary zeal strengthened France in her allegiance, and brought England, Germany, and Spain under the sway of Roman Christianity. His works were edited by the Benedictines, with biography. Consult *Life* by Kellett, by Snow, and by Dudden (2 vols., 1905).

Gregory II. (715-31) was born in Rome about 669, and succeeded Constantine in the papal chair. His pontificate was marked by the controversy with the Emperor Leo III. over image-worship, and the development of monasticism. Gregory III. (731-41), the last pope whose election received imperial confirmation, later continued Gregory II.'s controversy with the Emperor, and the organization of the church in Germany under Boniface. Significant as a precedent, though without immediate result, was his appeal to Charles Martel for help against the Lombards. Gregory IV. (827-44). Gregory V. (996-9). Gregory VI. (1045-6). There was also an antipope of his name (1012).

Gregory VII. (1073-85), known as Hildebrand before he occupied the papal chair, was one of the most celebrated of the popes. He was born in Tuscany in 1020, and became famous as a preacher. Upon being deposed (1076) by the Emperor Henry IV. because of his prohibition of imperial investitures, Gregory retaliated by excommunicating and deposing the emperor. But Gregory was himself deposed in favor of Clement III. by Henry (1080), who besieged and captured Rome. His theory of papal absolutism was even more elaborate and far-reaching than that of Gregory the Great. Consult *Lives* by

Gfrörer, Stephens, Delarc, and Vincent. Gregory VIII., pope (1187); anti-pope (1118-21). Gregory IX. (1227-41), the successor of Honorius III., was born at Anagni, his pontificate being a long struggle between the Guelfs and the Ghibellines. He excommunicated the Emperor Frederick II. for refusing to engage in a crusade. On the emperor advancing to besiege Rome, Gregory died, broken-hearted, at nearly a hundred years of age. He instituted the Inquisition, promoted monasticism, and codified the canon law. Consult *Life*, in Italian, by Balan.

Gregory X. (1271-6), a Visconti, born at Piacenza in 1210, accompanied Edward, Prince of Wales, to Palestine. As Pope he is famous for his crusade in relief of the Holy Land, for his attempt to reconcile the Greek and Latin Churches, and for his promulgation at the Council of Lyons in 1274 of the constitution of the conclave to regulate the election of succeeding popes. Gregory XI. (1370-8) was born at Limoges in France; succeeded Urban V., and transferred the papal see from Avignon back to Rome in 1377. Gregory XII. (1406-15) was deposed in 1409, together with Benedict XIII., a rival claimant, but continued in office until the Council of Constance, when he abdicated (1415).

Gregory XIII. (1572-85), born at Bologna in 1512, was sent by Pope Pius IV. to the Council of Trent. He assisted the Jesuits in every part of the world, and their college at Rome owed its establishment to him. In the same city, in 1581, he founded the English college, and in 1582 promulgated the reform of the Julian calendar, the 'New Style,' which was adopted by all Roman Catholic countries. Gregory XIV. (1590-91), born at Cremona in 1535, is chiefly known as the Pope who excommunicated Henry IV. of France, and aided Philip II. of Spain with money and troops. Gregory XV. (1621-3), born at Bologna in 1554, succeeded Paul V., and assisted the Emperor Ferdinand II. against the Protestants, and the king of Poland against Sweden. He canonized Francis Xavier, Ignatius Loyola, Philip of Neri, and others. Gregory XVI. (1831-46) was born at Belluno in 1765, and succeeded Leo XII. in 1831.

**Gregory, Daniel Seelye** (1812-1915), American clergyman and educator, born in Carmel, N. Y. He became professor of metaphysics, logic, and English literature in the University of Wooster (1871-8), and then president of Lake Forest University (1878-86). He became the managing editor of *The*

*Standard Dictionary* (1890-94), editor of *The Homiletic Review* (1895-1904), and general secretary of the Bible League of North America. His published works include: *Christian Ethics* (1875); *Constructive Studies in John, the Gospel for the Christian* (1909).

**Gregory, St.** (third and fourth centuries), surnamed 'Illuminator,' the Apostle of Armenia, is said to have been descended from the Arsacidæ, the royal race of Parthia and Armenia. His father having assassinated the king of Persia, all the family were murdered except Gregory, who was taken to Cæsarea and brought up a Christian. Returning as missionary to Armenia (c. 286), he finally healed the king of an affliction, and secured the establishment of Christianity as the religion of the country. He was consecrated bishop of the Armenian Church by Leontius, archbishop of Cæsarea. Consult Malan's *Life and Times of Gregory the Illuminator* (Eng. trans.).

**Gregory, Thomas Watt** (1861-1931), American lawyer and Cabinet official, was born in Crawfordsville, Miss. He served as special State counsel in prosecuting violations of the State antitrust laws; assistant attorney of Austin (1891-4); regent of the University of Texas; and special assistant to the U. S. Attorney-General (1913-14). In August, 1914, he was appointed Attorney-General of the United States in the Cabinet of President Wilson.

**Gregory Nazianzen, St.,** (c. 330-89), was born at Arianzus, near Nazianzum, in Cappadocia. In 372 Gregory was made bishop of Sasima in Cappadocia. In 378 he was persuaded to take up the orthodox cause at Constantinople, and was elected archbishop. This provoked such violent opposition on the part of the Arians that he preferred to resign, and returned to Asia (381). Gregory may fairly be pronounced one of the first orators and most accomplished and thoughtful writers of all times. His surviving works consist chiefly of letters and dogmatic and moral poems, prayers and hymns, autobiographic and historical poems.

**Gregory of Nyssa, St.** (fourth century), a younger brother of St. Basil, was born at Cæsarea in Cappadocia. After being a teacher of rhetoric, he was in 372 induced by Basil to accept the bishopric of Nyssa, near Cæsarea. The Arians persecuted him for his support of Nicæa, and in 375 convened a synod, which deposed him for contumacy. He was restored on the death of Valens (376), and

took a prominent part in the Œcumenical Council at Constantinople (381). Of the three Cappadocians, Gregory was the greatest speculative theologian, the most faithful to Origenistic views, and not the least zealous defender of Nicene doctrine. His chief dogmatic work is his *Twelve Books Against Eunomius*. In his great *Catechetical Discourse*, which was written to convince educated heathens and Jews, he argues that the incarnation is the best possible form of redemption, as manifesting the four chief attributes of God—His omnipotence, mercy, wisdom, and justice.

**Gregory of Tours, St.** (538-94), the 'father of Frankish history,' was born at Arvern, now Clermont-Ferrand, in Auvergne. Elected bishop of Tours (573), he was much harassed in the civil wars, in which he sided with Sigbert against Chilperic. After the death of Chilperic he enjoyed great influence over his successors, Guntram and Childebert II. His chief work, the *Historiæ sive Annalium Francorum libri x.*, is the main authority for his history of Gaul in the sixth century.

**Gregory Thaumaturgus** ('Wonder Worker'), a celebrated disciple of Origen, and the Apostle of the Christian Church in Pontus, was born of wealthy heathen parents at Neocæsarea, in Pontus. Coming under the influence of Origen at Cæsarea in Palestine, he was his disciple for about eight years. Returning to his native country, he was consecrated bishop of Neocæsarea (240). The influence of Gregory in Asia Minor continued from the middle of the third to far down into the fourth century. His celebrated *Eκthesis*, or *Confession of Faith*, is a summary of the theology of Origen, and is of the greatest value as a record of the state of theology at that time.

**Greifswald**, town, Pomerania, Prussia; 3 miles from the Baltic. It is the seat of a university (1456), with 900 students. From 1631 to 1815 it was almost continuously a possession of Sweden; p. 28,000.

**Greisen**, a modification of granite in which the feldspar has been replaced by quartz, topaz, and white mica. It is one of the characteristic rocks of tin-bearing regions.

**Grellet, Stephen** (1773-1855), Quaker missionary, was born of a noble family in Limoges, France. Escaping the revolutionaries, he fled to the United States (1795), joined the Quakers, and during the yellow fever plague at Philadelphia (1798) ministered to the stricken. He toured through the

Southern States, preaching the Gospel, and made similar tours in the Northeast and in Canada and Europe. Consult Seebohm's *Life*.

**Grenada**, British island and colony, West Indies, the southernmost of the Caribbee islands. It is 21 miles long and 12 broad, and contains 123 sq. miles. The island has several lofty volcanic craters, the highest being St. Catherine (2,750 ft.). The rainfall is excessive, sometimes 200 inches annually. A prominent natural feature is the Grand Etang, a lake occupying the site of an ancient crater. The island was discovered by Columbus in 1498, and called Concepcion. It was taken from the French in 1762, and recaptured by them in 1779, but was ceded to Britain by the treaty of Versailles (1783). It is the headquarters of the Windward government, which comprises the colonies of St. Lucia, St. Vincent, the Grenadines, and Grenada. The capital, St. George, stands on a fine harbor in the southwest; p. 75,214.

**Grenade**, a hollow ball of iron filled with explosives, and burst by means of a lighted fuse. Hand grenades were thrown upon the enemy by soldiers.

**Grenadier**, originally a tall, strong foot soldier trained to throw grenades. The term is now preserved in the designation of royal household troops or guard corps in European armies.

**Grenadines**, a chain of small islands of the Windward Group, West Indies, extending for 60 miles between St. Vincent and Grenada. Area, 13 sq. miles; p. 8,000, the larger part residing on Carriacou, the chief island. Principal exports are cotton and cattle.

**Grenfell, Francis Wallace, Baron** (1841-1925), British general, served in the Kaffir War, Zulu War, Boer War and in Egypt (1882-85), where he took part in the Nile expedition, and was commander-in-chief (1885-92); during this time he reorganized and trained the army. He commanded the forces in Egypt (1897-8), was commander-in-chief and governor of Malta (1897-1903), and was in command of the forces in Ireland (1904-08). In 1908 he was made a field marshal.

**Grenfell, George** (1849-1906), English explorer, was born in Mount Bay, near Penzance, Cornwall. Sent by the Baptist Missionary Society to the Cameroons, he in 1878 went to the Congo, discovered the outfall of the Mobanga River into the Congo (1884), ascended the Congo n., and made a tracked survey of about two thousand miles of the Upper Congo. Consult Hawker's *Life*.

**Grenfell, Wilfred Thomason** (1865-1940). Br. medical missionary, was born in England, and was educated at Oxford University and the London Hospital. In 1889 he engaged in the work of the Royal National Mission to Deep Sea Fishermen; fitted out the first hospital ship for British fishermen in the North Sea; and established homes for them on land and mission vessels at sea. In 1892 he went to Labrador, where he built four hospitals, a series of co-operative stores, an orphanage, and a school, and devoted himself to the religious and industrial improvement and medical care of the Newfoundland and Labrador fishermen. In 1912 he opened the King George v. Seamen's Institute at St. Johns, Newfoundland, the funds for its erection having been raised by him. He published: *Adrift on a Pack of Ice; A Man's Faith; Down to the Sea; Down North on the Labrador; The Adventure of Life; Immortality*, etc. In 1932 he published his autobiography, *Forty Years for Labrador*. His valuable and self-denying services have won for him many honors including the C.M.G. (1906), and the Murchison Bequest of the British Royal Geographical Society (1911). He was knighted in 1927.

**Grenoble** (ancient *Gratianopolis* or *Cul-laro*), tn., ft., and episcopal see, and capital of Isère depart., France, on both sides of the River Isère, 27 m. southwest of Chambéry; was also cap. of the former prov. of Dauphiné. It is dominated by Mont Rachais to the n. Being one of the most beautiful spots in France, it is a great tourist center. It is the seat of a bishop, and has a university. The manufacture of kid gloves is the chief industry. A large business is done in walnuts; p. 86,000.

**Grenville, or Greynville, Sir Richard** (?1541-91), English seaman, belonged to Stour and Bideford, Devonshire. He commanded for his relative Raleigh the latter's second expedition to Virginia in 1585, and left there a colony under Ralph Lane. In command of the *Revenge* he was with Howard's fleet sent to intercept the Spaniards at the Azores in 1591, but was cut off and overpowered after a desperate fight in which he was mortally wounded. Consult: Hakluyt, *Voyages*, vols. II. and III. (London, 1809-12). Tennyson's 'Ballad of the Revenge' celebrates his death.

**Grenville, William Wyndham, Baron** (1759-1834), son of George Grenville. He was made Speaker of the House of Commons in 1789, was Secretary of State for the

Home Department (1790), and succeeded the Duke of Leeds as Secretary for Foreign Affairs (1791). He resigned office with Pitt in 1801, but in 1806 formed the ministry of 'All the Talents,' which, though it only held office for one year, passed the Act for the Abolition of the Slave Trade.

**Gresham, Sir Thomas** (1519-79). English merchant and ambassador. His advice to Queen Elizabeth that 'bad money drives out the good' has by later economists been properly called 'Gresham's law.' He devoted his great wealth to public uses—built the Royal

was a candidate for the presidential nomination. In 1893 President Cleveland appointed him secretary of state.

**Gresham's Law**, the dictum that 'bad money drives out good,' first used in the proclamation of 1560 respecting the decrial of base silver coin, in which Sir Thomas Gresham took an active part in advising Queen Elizabeth.

**Gretna Green**, vil. Dumfriesshire, Scotland, just over the English border; famous for the runaway marriages celebrated there under the lax Scot's law which was satisfied



*Wilfred T. Grenfell and his Hospital Station, Labrador.*

Exchange for London merchants, and also established and endowed Gresham College in London. See Burgon's *Life and Times of Sir Thomas Gresham* (1839).

**Gresham, Walter Quinton** (1832-95), American, born near Lanesville, Harrison co., Ind. In the Civil War he had command of a division of Sherman's army on the march to the sea, but was forced by a serious wound, received at Leggett's Hill, to retire. In 1865 he was brevetted major-general. He was appointed District Judge for Indiana in 1869; postmaster general in 1882; secretary of the treasury and United States circuit judge in 1884, in which latter year, and in 1888, he

with mutual promises made in the presence of witnesses, no ceremony being required. The amelioration of the English marriage law, and an act of Parliament passed in 1856, requiring 21 days' residence in Scotland as a prerequisite to marriage there robbed Gretna Green of its sentimental importance.

**Grétry, André Ernest Modeste** (1741-1813), Belgian musical composer, born at Liège; settled in Paris, and became a popular composer, identified with the development of comic opera. Some of his compositions were adopted as political party songs of the day. Works: *Le Tableau Parlant* (1769), *Barbe*

*Bleue* (1789), *Zémire and Azor* (1771), *Richard Cœur de Lion* (1785), etc.

**Greuze, Jean Baptiste** (1725-1805), French genre painter, born at Tournus, near Mâcon; achieved success with his first picture, *The Bible-Reading* (1755). His reputation today rests largely on his portraits and single heads, especially those of young women and girls. The Wallace Collection, London, possesses the largest number of his works; but he is also admirably represented in the Louvre, and there are pictures of his in the Metropolitan Museum, N. Y. See Normand's *J. B. Greuze* (1892).

**Greville, Charles Cavendish Fulke** (1794-1865), English author; was from 1821 to 1860 clerk of the Council in Ordinary. He accumulated in the course of his long term in service the materials for *Memoirs*, published in three parts (1875, 1885, and 1887), which furnish important sidelights on the history of the 19th century. Greville was also the anonymous author of *Past and Present Policy of England in Ireland* (1845), a plea for the payment of the Roman Catholic clergy. See Henry Reeve's preface to the *Memoirs* (1875).

**Greville, Sir Fulke, Lord Brooke** (1554-1628), English poet and statesman, was born at Beauchamp Court, Warwickshire. In 1577 he came to London with Sir Philip Sidney, and was received into high favor by Elizabeth. To this period probably belong his poems, of which the tragedy *Mustapha* (1609) alone appeared during his lifetime. Greville's affection for Sidney issued in a prose *Life* (1652), a fine piece of elaborate writing. He became Chancellor of the Exchequer in 1614, and retained his office until 1621. See *Collected Works*, edited by A. B. Grosart (1870); Grosart's *The Friend of Sir Philip Sidney* (1894); *Cælica*, in M. F. Crow's *Elizabethan Sonnet-Cycles* (1896).

**Grevillea**, a genus of Australian shrubs and trees belonging to the order Proteaceæ.

**Grévy, François Paul Jules** (1807-91), French statesman and third president of the French republic, was born in Mont-sous-Vaudrey, Jura. A consistent republican, he strongly opposed the second empire, but was elected a deputy in 1868 and a member of the National Assembly in 1871-3, becoming president of the same in 1873. In 1876 he was chosen president of the Chamber of Deputies; and after MacMahon's resignation in 1879 was elected president of the republic.

**Grew, Joseph Clark** (1880- ), American diplomat, born at Boston. Mass. In

1918 he was named secretary-general of the American commission to negotiate peace and in 1919 was American secretary of the International Secretariat of the Peace Conference. In 1920 he became Minister to Denmark. He negotiated and signed the American-Turkish Treaty of 1923 and in 1927 was appointed Ambassador to Turkey. From 1932 to 1942 he was Ambassador to Japan; 1942-44, asst. to Secretary of State; 1944-45, Under-Secretary of State. See his collected speeches, *Report from Tokyo* (1942).

**Grewia**, a genus of tropical or sub-tropical trees and shrubs belonging to the order Tiliaceæ.

**Grey, Albert Henry George**, Fourth Earl (1851-1917), British public official who became governor general of Canada in 1904, succeeding the Earl of Minto. The friend of Cecil Rhodes, he became administrator of Rhodesia (1896-97) after the Jameson raid. During his term as viceroy in Canada (1904-09) the provinces of Alberta and Saskatchewan were inaugurated.

**Grey, Charles**, Second Earl Grey (1764-1845), British statesman, was born in Falldon, Northumberland. He moved the impeachment of Pitt, and for a time seceded (1797) from the House of Commons by way of protest against Pitt's conduct of affairs. In 1806 he became First Lord of the Admiralty and Foreign Secretary in the ministry of 'All the Talents,' which had been formed after Pitt's death; but retired with his colleagues (1807). On the death of his father in 1807 he removed to the House of Lords, and in 1830 he became the head of the ministry under which the Reform Bill of 1832, the bill abolishing slavery in the British Empire (1830), and the Poor Law Amendment Act (1834) were passed.

**Grey, Sir Edward** (1862-1933), British statesman. He was Under Secretary for Foreign Affairs (1892-5); Secretary of State for Foreign Affairs (1905-16); and in 1918 became president of Armstrong College, Newcastle. In 1919 he went on a temporary mission to the United States in regard to certain questions arising out of the peace. He was created Viscount Grey of Falldon in 1916. As Secretary of Foreign Affairs during the first years of the Great War, Lord Grey filled a most delicate and exacting position with great credit. Failing eyesight was a determining cause in his withdrawal from the House of Commons in 1916 and from then until 1922 he practically retired from public life. He later devoted himself to the cause

of the League of Nations. His publications include *Fly-Fishing* (1899); *Twenty-five Years, 1892-1916* (1925); *Fallodon Papers* (1926); *The Charm of Birds* (1927).

**Grey, Sir George** (1812-98), British colonial governor and statesman, was born in Lisbon, Portugal. Appointed governor of South Australia (1841), four years later he went as governor to New Zealand, where he soon terminated the first Maori war. As governor of New Zealand (1861), he terminated the second Maori war but his sympathy with the natives led to his dismissal (1867). Grey thereupon entered the New Zealand legislature (1874), and was premier in 1877-79. His publications include *Journals of Discovery in Australia* (1841); *Polynesian Mythology* (1855).

**Grey, Sir Henry George, Third Earl** (1802-94), British statesman, was born in Howick, Northumberland. He was appointed colonial under-secretary in his father's, Earl Grey's, reform administration (1830-3), resigning on the West Indian slavery question. Under Melbourne (1835) he became Secretary for War, and in 1841 opposed the policy of Peel. Succeeding to the earldom, he was Colonial Secretary under Russell (1846-52), and after that government's fall published a *Defence* of his colonial policy.

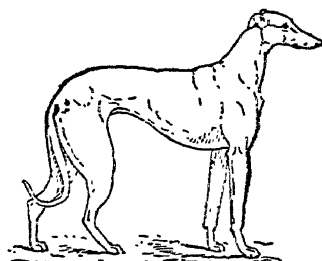
**Grey, Lady Jane** (1537-1554), 'the nine days' queen of England, was born in Bradgate, Leicestershire. She was the granddaughter of Henry VII's younger daughter Mary and the daughter of Henry Grey and Lady Frances Brandon. Her father allied himself to the Duke of Northumberland, Lord Protector of Edward VI., who compelled her to marry his fourth son, Lord Guilford Dudley, and on the death of Edward VI. had her proclaimed queen in London (July 10, 1553). Meanwhile Mary, daughter of Henry VIII., was on her way to London. Northumberland was too weak to oppose her, and the lord mayor and aldermen, obeying orders, proclaimed Mary queen (July 19, 1553). Lady Jane and her husband were beheaded in the Tower six months later.

**Grey, Zane** (1875-1939), author, was born in Zanesville, O. After practising dentistry in New York until 1904, he devoted his time to writing. Among his works are *The Mysterious Rider* (1921); *Wild Horse Mesa* (1928); *Fighting Caravans* (1929); *Sunset Pass* (1931); *Code of the West* (1934).

**Greyhen**, the female of the blackcock or black grouse.

**Greyhound**, a racing and hunting dog

famed for his sagacity and endurance. A medium sized dog should weight 65 or 70 pounds. A good greyhound is an affectionate animal, intelligent, and absolutely fearless.



Greyhound

**Greylock**, the summit of Saddle Mountain, the loftiest mountain of Massachusetts, in Berkshire County, about 4 miles southwest of North Adams. It is 3,535 ft. in height and the view from its summit is extensive.

**Greytown**, also known as **San Juan del Norte**, chief port of Nicaragua, on the Caribbean Sea, is built on the delta plain of the Rio San Juan. In 1848, the Mosquito Indians, supported by the British, seized the town, and it received its Anglo-Saxon name. In 1854 the town was bombarded and burned by a war vessel of the United States, because of an attack by a mob upon the United States minister; p. about 3,000.

**Gridley, Charles Vernon** (1845-98), American naval officer, was born in Logansport, Ind. From 1875 to 1879 he was stationed at the Naval Academy; was at the Boston Navy Yard, 1882-84; and in the lighthouse service from 1887 to 1897, when he was assigned to the *Olympia*, which he skillfully commanded at the battle of Manila Bay, May 1, 1898.

**Gridley, Richard** (1711-96), American soldier, was born in Boston. He served in the Colonial Wars, laid out the fortifications on Breed's Hill, and commanded the artillery in the famous battle there, known as the battle of Bunker Hill.

**Grieg, Edward Hagerup** (1843-1907), Norwegian musical composer and pianist, was born in Bergen. Early in his career he became known as a composer of outstanding merit, his fame in this direction eventually eclipsing his reputation as a pianist. To many he is best known by his compositions for the piano, but he also wrote orchestral suites, cantatas, quartets, trios, sonatas for violin

and for 'cello, besides a large number of charming songs.

**Grierson, Benjamin Henry** (1826-1911), American soldier, was born in Pittsburgh, Pa. He became a cavalry officer at the beginning of the Civil War, and in 1863 made a remarkable raid from La Grange, Tenn., to Baton Rouge, La., covering 600 miles in sixteen days, destroying railroads and telegraph lines, arms, and supplies, and cutting Vicksburg's communication with the East. He was brevetted brigadier general in 1867, and in 1890 was retired with the rank of brigadier general in the regular army.

**Grierson, George Abraham** (1851-1941), Irish orientalist, was born near Dublin. He entered the Indian civil service in 1873 and in 1898 became superintendent of the Linguistic Survey of India. He is a member of many linguistic societies and has received various prizes and medals. His publications include *Bihar Peasant Life*, with valuable illustrations (1885); *Modern Vernacular Literature of Hindustan* (1889); *Pisaca Languages of Northwestern India* (1904); *Manual of the Kashmiri Language, Comprising Grammar, Phrase-Book, and Vocabularies* (1911).

**Griesbach, Johann Jakob** (1745-1812), German theologian, was born in Butzbach (Hesse-Darmstadt). He was appointed professor at Halle being afterwards transferred (1776) to Jena, where he soon came to be regarded as the chief of that band of scholars to whom textual criticism of the New Testament owes its origin. His famous critical edition first appeared in 1774, marking an epoch in the history of the text.

**Griffenfeld, Peder, Count** (1635-99), Danish statesman, was born in Copenhagen. He won the favor of Frederick III., and was entrusted with the composition of the *Kongelov*, which made Denmark an absolute monarchy (1665). His aim was peace on the basis of a pan-Scandinavian league.

**Griffin, in heraldry**, a fabulous animal, with the head and fore feet of an eagle, and the body, hind legs, and tail of a lion. The head is represented with pricked ears, symbolical of its vigilance.

**Griffin, Charles** (1826-67), American soldier, was born in Ohio. During the Civil War he served with the Army of the Potomac, and was made brigadier general in 1862, and in 1865 major general of volunteers. He was one of the commissioners in charge of carrying out the terms of the surrender at Appomattox.

**Griffin, Gerald** (1803-40), Irish drama-

tist, novelist, and poet, was born in Limerick. In 1827 he published *Tales of the Munster Festivals*, and in 1829 his clever anonymous novel *The Collegians*, on which, in 1860, Boucicault based his *Colleen Bawn*.

**Griffs, William Elliot** (1843-1928), American clergyman and author, was born in Philadelphia, and educated at Rutgers College. In 1870 he went to Japan to organize schools on the American system. He returned to America in 1874 and after holding other charges, in 1893-1903 was pastor of the First Congregational church, at Ithaca, N. Y. His publications include *The Mikado's Empire* (1876); *Corea, the Hermit Nation* (1882).

**Griffith, David Llewelyn Wark** (1880- ), Am. motion picture director-producer, achieved fame with film dramas *The Birth of a Nation*, *Intolerance*, *Hearts of the World*, *Way Down East*; was first to use the device of the close-up and the fade-out.

**Griffon Bruxellois**, a variety of pet dogs, said to originate in Belgium.

**Griggs, John William** (1849-1927), American lawyer and legislator, was born in Newton, N. J. He was elected governor of New Jersey in 1895, but resigned in January, 1898, to become United States Attorney General, which office he filled until April, 1901. He served as a member of the Permanent Court of Arbitration at The Hague (1901-8), and in 1908 resumed his law practice in New York City.

**Grille**, properly speaking, a screen or grating of unfilled, pierced, or hammered metal, generally used to protect a window. The name also applies to the grating of metal bars sometimes placed in a door for purposes of observation.

**Grillparzer, Franz** (1791-1872), Austrian dramatist, was born in Vienna. His *Sappho* (1819), a play of character, with no violent effects, shows great dramatic power, and brought Grillparzer fame, and encouraged him to still more ambitious work—a trilogy on the classical subject of *The Golden Fleece*. The third part, 'Medea,' is often performed by itself; but the trilogy should be taken as a whole. His next play, *König Ottokars Glück und Ende* (1825), is one of the best historical tragedies in the German language. After visiting Goethe at Weimar, Grillparzer produced *Ein treuer Diener seines Herrn* (1828) and *Des Meeres und der Liebe Wellen* (1831), the story of Hero and Leander, often regarded as the most exquisite tragedy of love in German literature, and *Der Traum ein Leben* (1834), a mature and brighter coun-

terpart to *Die Ahnfrau*, fantastic and full of movement. As a dramatist Grillparzer is second only to Goethe and Schiller. A complete edition of his works in 20 vols., edited by A. Sauer, was finished in 1895.

**Grilse.** See **Salmon.**

**Grimaldi**, a famous Guelphic family who lived chiefly in Genoa for several centuries prior to the 18th. From 980 to 1731 they were princes of Monaco. When the Grimaldi line became extinct in 1731, the Goyon-Matignon house succeeded to the principality of Monaco, and to the name of Grimaldi.

**Grimaldi, Joseph** (1779-1837), a clown, unequalled for artistic and physical gifts, the son of an Italian clown who lived in London. He appeared on the stage when only two years old and from that time until his retirement in 1828 acted continuously.

**Grimké Sisters, The, Sarah Moore** (1792-1873), and **Angelina Emily** (1805-79), American abolitionists, born in Charleston, S. C. They freed their slaves after their father's death, and went to Philadelphia. Angelina married Theodore D. Weld, an anti-slavery leader, who, with the help of the two sisters, afterward established at Englewood, near Perth Amboy, N. J., a coeducational institution which became famous. Consult: Birney, *The Grimké Sisters* (1885).

**Grimm, Brothers—viz. Jacob Ludwig Karl** (1785-1863) and **Wilhelm Karl** (1786-1859)—were born at Hanau. They went to Göttingen in 1829, Jacob obtaining a professorship and being made librarian, his brother sub-librarian. In 1841 Frederick William IV. called them to the University of Berlin, where they remained. The brothers Grimm were the leaders of the band of distinguished men who in the 19th century devoted themselves to the scientific study of the German language and literature. Their most noteworthy books were the epoch-making *Deutsches Wörterbuch* (as far as *Frucht*) and the *Kinder- und Hausmärchen* (1812, 1815; new Eng. trans. 1900), a collection of genuine fairy tales, with most valuable notes. Jacob wrote an excellent *Deutsche Grammatik* (1819; 2d ed. 1822-40), *Geschichte der deutschen Sprache* (1848), etc.; *Deutsche Rechtsaltertümer* (1828), *Deutsche Mythologie* (1835). Wilhelm Grimm's best-known work is *Die deutsche Heldensage* (1829). His *Kleinere Schriften* (1881-6) contain his autobiography. See *Life*, in German, by Scherer (2d ed. 1884) and by Berndt; two books by A. Duncker (1884) and Schönbach (1885); and C. Francke's *Die Brüder Grimm* (1899).

**Grimm, Friedrich Melchior, Baron** (1723-1807), German literary critic and author of the *Correspondance Littéraire*, was born at Ratisbon, but spent the greater part of his life in Paris. His principal work was undertaken in 1753, and developed into a comprehensive commentary on events political, social, as well as literary, which for insight and brilliancy remains an invaluable reflection of the time.

**Grimma**, anc. tn. in kingdom of Saxony, on the Mulde; has a famous school (Fürstenschule), founded in 1550, and a 13th-century church; p. about 12,000.

**Grimmelshausen, Hans Jakob Christoffel von** (c. 1624-76). German novelist, was born at Gelnhausen, near Hanau, Hesse. His *Simplicius Simplicissimus* (1669) is the first German novel of real and enduring value; this and *Trutz-Simplex (Landstörtzerin Kurasche)*, the story of an adventuress, and *Springinsfeld*, the story of a soldier of fortune (both in 1670), *Vogelnest* (1672), *Verkehrte Welt* (1673), entitle him to the first place among 17th-century prose writers in Germany.

**Grimm's Law.** This law may be described as formulating (1) the parallel changes undergone by a characteristic group of Indo-European consonants when they pass over into Teutonic speech; (2) the changes undergone by the same consonants in their transition to High German. See Jacob Grimm's *Deutsche Grammatik*, pp. 584 ff. (2d ed. 1822) and *Geschichte der deutschen Sprache*, vol. I., pp. 394 ff. (1848); also W. Skeat's *Principles of English Etymology*, first series, ch. VII.-IX. (1887), and Victor Henry's *Grammaire Comparée de l'Anglais et de l'Allemand*, ch. IV. (1893).

**Grimsby, Great**, parl., munic., and co. bor. and seapt., Lincolnshire, England, at the mouth of the Humber, 35 m. n.e. of Lincoln. It is the chief fishing port in the country, with extensive foreign trade; p. 92,463.

**Grimmel Pass**, pass, Bernese Alps, Switzerland. Its altitude is 7,100 ft., and it is now traversed by a carriage-road. At the n. foot of the pass is the hospice (6,155 ft.).

**Grimthorpe, Edmund Beckett, Baron** (1816-1905), English lawyer, eldest son of Sir Edmund Beckett Denison. He designed, in conjunction with Airy, the astronomer-royal, Big Ben, the clock of Parliament.

**Grindal, Edmund** (?1519-83), archbishop of Canterbury, born at St. Bees in Cumberland. Bishop Ridley employed him in religious disputations. In 1559 he became bishop



of London. Elected to the see of York in 1570, he became archbishop of Canterbury in 1575. He was suspended for nearly six years for non-compliance with the orders of Elizabeth (1577-82), but was restored again.

**Grindelia**, a genus of hardy American composite plants with large yellow flower-heads. Owing to the sticky substance which forms on the involucre, they are known as gum-plants, or tar-weeds.

**Grindelwald**, a beautiful mountain-valley of the Bernese Oberland, Swiss canton of Bern, much frequented both in summer and in winter. It contains 3,346 inhabitants, practically all German-speaking and Protestants.

**Gringore, Pierre**, called **Gringoire** by Victor Hugo (c. 1475-1539), French satiric poet and dramatist, born at Caen in Normandy. His best known works are *Le Jeu du Prince des Sots et de la Mère Sotte*, a play (1511); *Le Mystère de Saint Louis* (c. 1528); and *Les Heures de Notre Dame*. He was an active opponent of Protestantism. His *Œuvres* were published in 1858-77. See Badel's *Pierre Gringoire* (1893). Beerbohm Tree has impersonated him.

**Grinnell, George Bird** (1849-1938), American editor and ethnologist, born Brooklyn. He was assistant in osteology at the Peabody Museum from 1874 to 1889, when he became president of the *Forest and Stream* Publishing Company, and an editor of that paper. He was awarded the Roosevelt gold medal of honor in 1925 and was president of the National Parks Association. His works include, *Pawnee Hero Stories and Folk Tales* (1892); *The Indians of Today* (1900), and *Two Great Scouts* (1929).

**Grinnell, Henry** (1799-1874), American merchant and promoter of Arctic exploration, was born at New Bedford, Mass. In 1850 he equipped an expedition, commanded by E. J. De Haven, to search the Arctic regions for Sir John Franklin, from whom nothing had been heard since 1845. De Haven did not find Franklin, but he discovered land at 80° N., which was named Grinnell Land. He was the first president of the American Geographical Society (1852), of which he was one of the founders.

**Grinnell Land**. (1.) The n.w. extremity of N. Devon, in the Arctic regions of N. America; discovered in 1850 by De Haven, in the first Grinnell expedition, when searching for Franklin. (2.) Large barren tract in the N. Polar basin, to the w. of N. Greenland, from which it is separated by Kennedy

Channel; discovered by Hayes in the second Grinnell expedition.

**Gripes**, or **Griping**, the popular term for the attacks of pain which accompany various colics.

**Griqualand**. (1.) East, native district in e. of Cape Colony, with a p. of 264,827. The district lies between the Drakensberg, Natal, Pondoland, and Tembuland, and has an area of 7,600 sq. m. The chief town and seat of magistracy is Kokstad. (2.) West, district formerly belonging to the Griquas, and famed for its diamond mines. The British flag was hoisted here in 1871. The province of Griqualand West forms part of Cape Colony, and has a total population of about 110,000. Area, 15,200 sq. m.

**Grisebach, August Heinrich Rudolf** (1814-79), German botanist, a native of Hanover. In 1841 he was appointed professor at Göttingen, and in 1875 was made director of the botanical gardens there. He was especially distinguished for his work on the geographical distribution of plants. His son, EDUARD (1845) became widely known through his poems, *Der neue Tannhäuser* and *Tannhäuser in Rom*.

**Griselda**, or **Griseldis**, the heroine of the well-known mediæval tale, is the model of patient submission and conjugal obedience. Her husband put her love and obedience to three terrible trials, but she emerged triumphant from them all. The story appears in Boccaccio's *Decameron*, and Chaucer celebrates the 'Patient Grizzel' in the *Clerkes Tale*.

**Grisi, Giulia** (1811-69), Italian operatic singer, born at Milan. Her appearances in Paris (1832-49) and in London (1834-61) won for her a world-wide reputation. She also paid a visit to the United States in 1854.

**Grison**, or **Huron** (*Galictis vittata*), a weasel-like mammal of Central and S. America.

**Grisons** (Ger. *Graubünden*), one of the Swiss cantons, admitted into the confederation as late as 1803. It is chiefly composed of the mountain-valleys wherein are the three chief sources of the Rhine, together with the upper valley of the Inn (or Engadine). In area it is the largest of the Swiss cantons (2,773 sq. m.); p. 119,854. The capital of the canton is Coire, and other well-known places are Davos, St. Moritz, Pontresina, and Arosa.

**Griswold, John Augustus** (1822-72), American manufacturer, was born at Nas-

sau. N. Y. He is remembered chiefly as the builder of the *Monitor*, and for his introduction into this country of the Bessemer steel-making process.

**Griswold, Matthew** (1714-99), American jurist, was born at Lyme, Conn. In 1771-84 he was lieutenant-governor of Connecticut and in 1784-85 governor. He became a judge of the State Supreme Court in 1766 and was chief justice in 1769-84. He was president of the convention which ratified the Federal Constitution.

**Griswold, Rufus Wilmot** (1815-57), American editor and writer, was born at Benson, Vt. He was editor of the *International Magazine*, afterwards incorporated with *Harper's Magazine*. His compilations were popular, among them being *Poets and Poetry of America* (1842), *Prose Writers of America* (1846). He edited the first American edition of Milton's prose. He wrote a *Life* of Edgar Allan Poe, prefixed to his edition of Poe's *Works* (3 vols. 1850), which called forth much adverse comment. See his *Correspondence*, edited by his son, W. M. Griswold (1898).

**Grit**, a coarse-grained arenaceous rock, intermediate between sandstone and conglomerate. The cementing material is usually siliceous, but some grits have a matrix of lime carbonate or iron oxide.

**Grivet**, a small, greenish, N. African monkey, one of the guenons, often seen in captivity, where it is hardy, docile and amusing.

**Groat**, the name given in mediæval times to all thick coins, to distinguish them from those which were only stamped on one side. The silver groat, originally issued in the 14th century, was worth fourpence of our money.

**Gröber, Max Gustav** (1844-1911), German Romance philologist, born at Leipzig. After 1877 he edited the *Zeitschrift für romanische Philologie*, which holds its own with *Roumania* as an organ for the advancement of Romance philology; while the *Grundriss der romanischen Philologie* (1885-1902), issued under his supervision, is indispensable to the student.

**Grolier de Servières, Jean, Viscount d'Aguisy** (1479-1565), French book-collector, born at Lyons. The foundation of his famous library, which afterwards grew to 3,000 volumes, was laid in Italy. See *Recherches sur Jean Grolier*, by Le Roux de Lincy (1866).

**Grolier Club**, an association of lovers of beautiful books, in New York city, founded in 1884. It has a club house containing a good

library and valuable prints and pictures. The club has issued, in fine bindings, more than a score of books on typography, bookbinding, and other matters interesting to bibliophiles.

**Groningen**. Principal tn. in the n. of the Netherlands, and chief tn. of the prov. of Groningen, stands 20 m. s.w. of the Dollart; is the seat of a university, founded in 1614. It possesses several 17th-century and other old houses, and is famous for its corn and oil-seed markets. It was taken from the Spaniards by the Dutch, after a stubborn defence, in 1594; p. 103-432.

**Gronovius** (the Latinized form of **Gronov**), the name of a learned family of German origin, who settled in Holland.

**Groome, Francis Hindes** (1851-1902), son of Archdeacon Groome of Suffolk, was born at his father's rectory of Monk Soham. His *Gypsy Folk-Tales* (1899) is a marvel of recondite learning, and he was one of the founders of the Gypsy Lore Society, and joint-editor of its *Journal* (1888-91).

**Groot, Gerhard** (1340-84), founder of the 'Brethren of the Common Life,' was a native of Deventer. Becoming a missionary preacher in 1379, he devoted his energies to the community of 'Brethren of the Common Life,' which included both clerical and lay members, who supported themselves by their own industry, while following the rule of St. Augustine. A corresponding sisterhood was also founded, and the order spread throughout the Netherlands, until its extinction at the Reformation. See Ullmann's *Reformers before the Reformation* (Eng. trans. 1855), and *Vita Gerhardi Magni*, by Thomas à Kempis, the first authority.

**Gros, Antoine Jean, Baron** (1771-1835), French painter, born in Paris; entered David's studio (1785). Bonaparte attached him to his headquarters as military painter (1796). He broke away from the classical traditions of David, and gained his brilliant reputation as historical painter of Napoleon's career. His best works include *The Battle of Nazareth*, 1802 (Nantes); *General Bonaparte Reviewing the Troops* (Wallace Collection, London). See J. Tripiet de Franc's *Histoire ... du Baron Gros* (1878).

**Grosart, Alexander Balloch** (1827-99), British divine and scholar, born at Stirling. His most important work was as editor of Elizabethan and Jacobean writers, contained in the *Fuller Worthies Library* (39 vols. 1868-76) and the *Chertsey Worthies Library* (14 vols. 1876-81).

**Grosbeak**. Any of several finches with very

large beaks. The commonest in the Eastern United States is the rose-breasted (*Habia Ludoviciana*)—a brilliant singer; the black-head.

**Grose, William** (1812-1900), American soldier and legislator. He commanded the Third Brigade at Nashville, and was brevetted major-general of volunteers in 1865. He served in the Indiana legislature, 1875-83.

**Gross, Charles** (1857-1909), American historian and professor of history at Harvard. His works include: *Bibliography of British Municipal History* (1898); and *Sources and Literature in English History* (1900).

**Grosseteste, Robert** (?1175-1253), bishop of Lincoln, English historian and writer. He not only wrote on theology and history, but also composed commentaries on Aristotle, poems in French, works on farming, medicine and music, and translations from Greek authors. See H. R. Luard's edition of Grosseteste's *Letters* (Latin; 1862), Pegge's *Life of Grosseteste* (1793), and Stevenson's *Life of Grosseteste* (1899).

**Grosseto.** Town and episc. see, cap. of the prov. of Grosseto, Italy. Its cathedral dates from 1294; p. about 12,000.

**Grossulariaceæ**, a natural order of shrubby plants, of which the gooseberry and the currant are the principal representatives.

**Grossularite**, a calcium aluminium garnet, colorless, pale green, yellow to brown, or rose-red in color. It is specially common in crystalline limestones and schists. See GARNET and CINNAMON-STO.

**Grosz, George** (1893- ), painter and caricaturist. After studying in Germany, he studied in Paris and was summoned back to Germany at the outbreak of the war. While at the front he created a book of caricatures showing the horrors of war, which won him international fame. His later drawings were symbolic reflections of post-war Germany, followed by his *Ecce Homo*, whose stark realism appalled Europe and the U. S. By political satirical drawings, he lost favor with Nazi Germany. He is also noted for portraits and landscape paintings. In 1935 he resided in New York City.

**Grote, George** (1794-1871), English historian. He devoted his leisure to literature, and in 1846 published the first volume of *The History of Greece*. This was followed by *Plato and other Companions of Socrates* (1865). See *Personal Life of G. Grote* (1873), by his widow; and his *Minor Works* (ed. A. Bain, 1873).

**Grotefend, George Friedrich** (1775-

1853). German scholar, born at Münden, Hanover. He is chiefly famous for deciphering with great patience and extraordinary ingenuity the ancient cuneiform writing of Babylonia.

**Grotesque**, a style of capricious ornament, distinguished by the intermingling of figures, animals, flowers, fruits, etc., from arabesque, which is confined to plant forms. This style was generally favored during the Renaissance, but soon became debased. The term is also applied to extravagant, whimsical, or absurd representations of the human figure. See CARICATURE.

**Groth, Klaus** (1819-99), German poet. His fame rests chiefly on the collection of poems entitled *Quickborn* (1852).

**Grotius, Hugo, or Huig van Groot** (1583-1645), Dutch jurist, born at Delft. In 1615 he was sent to England to arrange the difficulties arising from the whale fisheries of Greenland. On May 18, 1619, he was condemned to perpetual imprisonment, but after eighteen months' confinement he escaped and found shelter in Paris. He wrote during his imprisonment his treatise on the *Truth of the Christian Religion*, in Dutch verse (which he translated into Latin prose in 1627), and also wrote the *Inleydinghe tot de Hollandsche Rechtsgeleerdheyd* (1639). Among his works on jurisprudence, *De Jure Belli et Pacis* (1625; English trans. by Whewell, 1853) is the most famous; and in history the *Annales et Historiæ de Rebus Belgicis* (1657). Grotius was intellectually one of the greatest men of his age, while as a scholar he stood in the very first rank for variety and breadth of culture. Consult *Life* by Buller.

**Groton**, town, New London co., Conn., on the Thames R., opposite New London. A monument commemorates the massacre of the garrison in 1781. Groton was settled about 1650, and was first incorporated separately from New London in 1704. Benedict Arnold with 800 British took the fort on Sept. 6, 1781. Colonel Ledyard, the American commander, was run through with the sword which he had surrendered, and every member of the garrison was either killed or wounded; p. 10,910.

**Grouchy, Emmanuel, Marquis de** (1766-1847), French general, born at Paris. He distinguished himself at Hohenlinden, Eylau, Friedland, Wagram, and in the Russian campaign of 1812. He was one of the first to join Napoleon on his return from Elba, was created a marshal of France, and defeated Blücher at Ligny. Though within

sound of the guns of Waterloo, he failed to come to his chief's assistance in time. Consult his *Mémoires*.

**Ground Annual**, in the law of Scotland, an annuity or rent made a perpetual charge on certain land; analogous to the rent-charge of the common law.

**Ground Dove**, a small, handsome dove (*Columbigallina passerina*), with poor powers of flight, which seeks its food (seeds, berries, etc.) on the ground. It is common in the warmer parts of the United States and the Antilles. Several other related birds of terrestrial habits are called 'ground doves' or 'ground pigeons.'

**Ground Ivy** (*Clecoma hederacea*), a common European labiate hedgerow plant, with trailing stems, kidney-shaped, crinkled, aromatic leaves, and axillary, purplish flowers in early summer.

**Ground-nut**, a common name for edible portions of various plants—e.g., the pods of the ground peanut (*rachis hypogæa*), the tuberous roots of the earth-nut (*Bunium esculentum*), the roots of Apios, the roots of the dwarf ginseng (*Aralia trifolia*). See EARTH-NUT.

**Ground Pine**. Several species of the club-mosses (*Lycopodium*), which are used for Christmas decorations, are known by this name; such as the *L. obscurum*, with erect branches, and the creeping *L. clavatum*.

**Ground Rent**, in English law, the rent reserved on land let for long terms for building purposes. The term is sometimes employed in the same sense in the United States. In Pennsylvania and Maryland, however, it is used in a special sense—to designate, in the former, a perpetual rent charge, and in the latter, rent reserved on leases for ninety-nine years, renewable forever.

**Groundsel** (*Senecio vulgaris*), an annual weed belonging to the order Compositæ. It has yellow flowers and dentate leaves. There is a larger species, common in gravel soil, called the Mountain Groundsel (*S. sylvaticus*).

**Grouper**, any of several sea bass (*Sewanidae*), large, tropical fishes of the genus *Epinephelus*, handsomely colored, excellent as food, and affording sport to anglers.

**Groups, Theory of**, a modern branch of mathematics in which operations, and not quantities, are the immediate subject of discussion. The set or series of operations which make up a group must be so related among themselves that the successive application of any two will be equivalent to another of the

group, or to the 'identical' operation. Thus, the rotations through a right angle about three perpendicular axes meeting at a point form with their universes a group; for if  $ijk$  represent these rotations about the axes  $xyz$  (see CO-ORDINATES), then  $ij=k$ ,  $jk=i$ ,  $ki=j$ ,  $ii^{-1}=1$ , etc. This combination of an operator and its inverse is the identical operation, leaving the subject of it unchanged.

Many groups contain an infinity of members—such, for example, as all rotations of a plane figure round a fixed axis perpendicular to its plane; for the result of any two rotations is equivalent to a third. Now the quantity  $x^2y^2 - y^2x^2$ , where  $x^2y^2$  and  $y^2x^2$  are the co-ordinates of two given points, never changes value whatever rotation may be given to the figure; it measures twice the area of the triangle formed by joining the two points and the center of rotation. Such a quantity, which is unchanged by the application of any member of the group, is said to belong to the group or to be an invariant of the group.

The operations of a group may be finite only, as in the case first mentioned, and the group is then said to be 'discontinuous.' In a continuous group transition may be made from member to member by infinitesimal changes, such, for example, as the group which includes all rotations about a fixed axis. The whole of the mathematical theory of crystallography is built upon the properties of certain discontinuous groups, for an account of which consult Hilton's *Mathematical Crystallography* (1903), and Brunside's *Theory of Groups of Finite Order* (1911).

**Grouse**, a term strictly applicable to all the members of the sub-family Tetraoninae, but usually employed in a much more restricted sense. Three species of grouse occur in Great Britain—the Black Grouse (see BLACK-ROCK), the Wood Grouse (see CAPERCAILLIE), and the Red Grouse (*Lagopus scoticus*), one of the ptarmigans, and the bird to which the term is usually restricted in ordinary speech.

American grouse are numerous and varied, the Eastern United States having one prominent species in the Ruffed Grouse (*Bonasa umbellus*), and the Western States others in the Prairie Chickens, Sage Grouse, etc. In the Northern forested regions are to be found several species of tree-perching grouse—the Spruce Grouse, Franklin's Grouse, etc. The ruffed grouse and prairie chickens afford excellent sport when shot over dogs. Consult Coues' *Birds of the Northwest*; Leffingwell's

*Shooting on Upland, Marsh, and Stream*; Dixon's *The Game Birds and Wild Fowl of the British Islands*.

**Grove, Sir George** (1820-1900), English editor, was born in London. He edited *Macmillan's Magazine* (1868-83), and *The Dictionary of Music* (4 vols. 1878-89; new ed. 1906) that gave new impetus to musical literature in England. He was the first director of the Royal College of Music. Consult Graves' *Life and Letters of Sir George Grove* (1903).

**Grub**, a convenient term, used without any very great precision, for the concealed and burrowing larvæ of many insects, especially of beetles. They are usually to be found in earth, rotten wood, fruit or a similar place, and are more or less worm-like in appearance.

**Grub Street**, described by Dr Johnson as 'originally the name of a street near Moorfields in London, much inhabited by writers of small histories, dictionaries, and temporary poems, whence any mean product is called Grub Street.' Milton Street is the present name of the thoroughfare. The expression is often used in allusion to the sordid misery of literary hacks.

**Grundtvig, Nicolai Frederik Severin** (1783-1872), Danish theologian, historian and author, born at Udby, in Zealand. After fiercely assailing rationalism generally in *Kort Begreb af Verdens Krønike* (1812), he in 1825 began a lifelong polemic against unbelief in *Kirkens Gjenmæle*, and founded the *Theologisk Maanedsskrift*, the first step towards his projected reformation of the church on a more popular and national basis, and the establishment of what is generally called after him *Grundtvigianism*, which found numerous enthusiastic adherents all over Scandinavia. His most lasting work is embodied in his *Sangverk til den Danske Kirke* (1837-42), *Salmer* (1873-80), *Poetiske Skrifter* (1880-9).

**Grundtvig, Svend Hersler** (1824-83), Danish editor, born at Copenhagen, son of the above; became editor of the masterly collection of Danish folk-songs entitled *Danmarks Gamle Folkeviser* (5 vols. 1853-83), *Gamle Danske Minder i Folkemunde* (1854-61), *Danske Folkeeventyr* (1876-8), and *Sæmund's Edda* (1868).

**Grus** (= the Crane), a small constellation lying s. of Piscis Australis, formed by Bayer in 1604.

**Grütli**, or **Rütli**, meadowland, canton Uri, Switzerland, on w. side of Lake Lucerne, 7

m. n.w. of Altorf; is noted as the traditional meeting-place of Stauffacher, Arnold of Melchthal, Walter Fürst, and thirty others, who on Nov. 8, 1307, there founded the Swiss League against Austria. The meadow was purchased (1850) by the school children of Switzerland, and is preserved as national property. See Schiller's *Wilhelm Tell*, II. 2.

**Gruyères**, tn., Switzerland, 16 m. s.w. of Fribourg. The district is celebrated for its cheeses, but not all the Gruyère cheese is produced here; p. 1,383.

**Gryllus**, the genus to which the crickets belong.

**Gryphius**, or **Greyff, Sebastian** (1493-1556), German printer, born at Reutlingen in Swabia. He went (1528) to Lyons, where, down to his death, more than three hundred books issued from his press, mostly in Hebrew, Greek, and Latin, and in bold italic type.

**Guacharo**, or **Oil-bird** (*Steatornis caripensis*), the type of a peculiar family, related both to the night-jars and to the frog-mouths. It is found in northern S. America, and in Trinidad. The fat of the nestlings yields a valuable oil.

**Guadagnini**, an Italian family of violin-makers. The first and most famous, **LORENZO** (1695-1740, Cremona and Milan), and his son, **GIOVANNI BATTISTA** (1711-86, Milan, Piacenza, and Turin), were pupils of Stradivarius.

**Guadalajara**. (1.) Province, Spain, with an area of 4,676 sq. m.; p. 200,186. (2.) City, cap. of above prov., 35½ m. n.e. of Madrid. Its main features are a great military engineering academy, the palace of the Mendozas, and the Pantheon in which they are buried; p. 10,944. (3.) Capital of the State of Jalisco, Mexico, 380 m. n.w. of Mexico City. The magnificent cathedral contains a famous Assumption by Murillo, and the theatre, the Degollado, is the largest in America after the New York opera house. Here are also a university and an art academy. Paper, Panama hats, leather and glass are manufactured.

**Guadalaviar**, riv. of Spain, rising in Teruel, and flowing into the Mediterranean at Valencia. Its romantic scenery has been immortalized by native poets.

**Guadacanal**, one of the Solomon Islands. Here, in World War II, in late 1942, the Japanese suffered a major defeat at the hands of U. S. marines and soldiers.

**Guadalquivir** (Arab. *Wady al Kebir*; the *Bætis* of the Romans), riv. of S. Spain, rises in Sierra Morena, flowing s.w. for 370 m.,

through a great part of Andalusia. It is tidal as far as Seville (70 m.), to which it is accessible for shipping of large tonnage.

**Guadalupe**, riv. of Texas, flowing s.e. to San Antonio Bay, an arm of the Gulf of Mexico, which it enters through the San Antonio River. Length, 250 m.

**Guadalupe Hidalgo**, tn., Mexico,  $3\frac{1}{2}$  m. n. of Mexico City; has a church with a shrine of the Virgin of Guadalupe, much visited by pilgrims. Here on Feb. 2, 1848, at the close of the Mexican War, was signed a treaty between the United States and Mexico, by which the latter ceded Upper California and New Mexico to the United States.

**Guadalupe Mts.**, in Texas and New Mexico, between the Pecos River and the Rio Grande. The trend is central and in a north-westerly direction, and the range, under certain local names, unites with the e. spurs of the Rocky Mountains. Maximum elevation, about 6,000 ft.

**Guadarramas**, a range of Spanish mountains branching nearly at right angles from the Iberian system near Medinaceli, running w. to the Portuguese coast, and dividing the valleys of Tagus and Douro.

**Guadeloupe**, island of French W. Indies, in the Lesser Antilles, is composed of two islands separated by a channel, the Grande-Terre and the Basse-Terre. The former is a low plain while the latter is surmounted by four cloud-capped mountains. With its dependencies—Marie Galante, Les Saintes, Désirade, St. Barthélemy, and St. Martin—it has a total area of 688 sq. m., with a population of 182,112. Sugar and coffee are the chief products. Cotton, rubber, cocoa, vanilla, spices, and tobacco are also cultivated, and the forests of Basse-Terre are rich in logwood. Pointe-à-Pitre is the principal seaport.

**Guadiana**, riv. of S. Spain, rises in the Sierra Morena. Some 30 m. from its source it disappears, and flows by a subterranean passage to the Zancara, which may be considered its head stream. Its total length is about 500 m., but it is only navigable a few miles above its mouth.

**Guadix**, city and episc. see, prov. Granada, Spain, 30 m. n.e. of Granada, on n. slopes of Sierra Nevada. The old cathedral is charming; p. 15,000.

**Guaiacum**, a genus of W. Indian tropical American trees from which is obtained by natural exudation or incision the guaiacum resin of the pharmacopœia. This resin, greenish in color, is used in medicine as a stimulant.

**Gual, Pedro** (1784-1862), Venezuelan political leader, was born at Caracas. He joined in the revolution of 1810, and was afterward Governor of Cartagena and ambassador to the United States from Venezuela. In the Castro régime he became president of the Council of State, and in 1860 he was vice-president and president, resigning in 1861.

**Gualdo Tadino**, tn., prov. Perugia, Italy, 22 m. by rail n. of Foligno. Here in the year 552 Narses defeated and slew Totila, king of the Ostrogoths; p. 10,756.

**Guam**, or **Guahan**, the most s. and largest island of the Marianne or Ladrone archipelago; area, about 150 sq. m. The southern part is hilly; the northern part presents one large plateau, ranging from 300 ft. in the interior to 600 ft. at the sea, with bold cliffs. There are several harbors—the best, San Luis de Apra, on the n.w. coast. The island is heavily forested with valuable hardwoods, and the soil, mainly of disintegrated coral, is fertile. Farming is the principal industry. The extreme range of temperature is from 66° to 90°, with a mean annual temperature of 81°. There are occasional hurricanes, and frequent slight earthquakes. Guam was occupied by the United States in 1898, during the Spanish-American War, and by the treaty of peace at the end of the war was relinquished by Spain. The capital is Agaña, which contains two-thirds of the total population. The natives are mainly Chamorros, mixed with Tagalos and Malays. The governor of Guam is a naval officer, and commandant of naval station; captured by Jap., 1941; p. 17,592.

**Guan** (*Penelope*), one of a group of South American game birds related to the curassows. The throat and chin are generally naked, with a wattle, and there is a bare space round the eye.

**Guanacaste**, province, Costa Rica, is situated in the n.w., and includes the Nicoya Peninsula. There are valuable forests and good grazing land. Area, 4,000 sq. m.; p. 33,000. The capital is Guanacaste, or Liberia; p. 3,500.

**Guanaco**, or **Huanaco** (*Auchenia huanacus*), one of the two wild members of the camel family in South America. It is believed to have been the progenitor of the domesticated alpaca and llama. It is larger and more heavily built than the vicuña, and is found from Ecuador and Peru to Patagonia and Tierra del Fuego.

**Guanahani**, the native name of the first island on which Columbus landed in 1492. It was named by him San Salvador, and is

supposed to be the present Watlings Island of the Bahamas—or else Cat Island.

**Guanajuato**, capital of the state of Guanajuato, Mexico; 180 m. n.w. of Mexico City. The city is built between and against the walls of a canyon, and is Moorish in appearance. The theatre—'Teatro Juarez'—is one of Mexico's most beautiful structures. The Pantheon, on a hill overlooking the city, contains the only mummies in America. Guanajuato is the center of one of the richest mining districts in Mexico, and is noted for its pottery. The Valenciana Mine nearby—the richest silver mine in the world—has produced a billion dollars' worth of ore. The town was established in 1554 by the Spanish invaders, and marks the first mining camp in North America. It was the scene of many combats between the natives and the Spanish conquerors. The first great battle of the war of independence was fought here (1810). It was partially destroyed by floods in July, 1905; P. 35,147.

**Guanches**, or **Guanchos**, the original race found in the Canary Islands by the Spaniards, who completed their subjugation about 1500. They are now almost extinct.

**Guanine** ( $C_5H_5N_5O$ ) is a complex nitrogenous compound of basic character that is allied to uric acid, and is found in guano and other animal products. It is extracted from guano, and forms a white powder insoluble in water.

**Guano**. This valuable fertilizer consists of the *excreta* of fish-eating sea fowl, such as gulls, cormorants, and penguins, and of walruses, seals, and the like, together with other animal remains, as birds' feathers and bones. It possesses a pungent, characteristic odor, and varies in color from light to dark brown. The chemical composition of guano is extremely complex, and differs with the locality of the deposit. The most highly nitrogenous and therefore most valuable guano is exported from the Chincha and other islands off the coast of Peru. The high manurial value of guano is due to the fact that it is a general fertilizer, yielding all the constituents of plant food in a condition that can be readily assimilated. Agricultural chemists also prepare a chemical substitute for the natural product, which is considered of equal power and utility.

**Guantánamo**, city, in Southeast Cuba, province of Oriente, on the Guaso River; 13 m. by rail n. of its port, Caimanera, on Guantánamo Bay. It is situated in a rich agricultural section, and has considerable trade with

the United States in coffee, lumber, and sugar. Guantánamo Bay, by agreement with the United States (1901), is an American naval station, with anchorage room for 100 battleships. An additional land tract was ceded to the United States in 1912. During the Spanish-American War the eastern shore of Guantánamo Bay was occupied by United States forces; p. of the city, 15,500; of the municipality, 45,000.

**Guaporé**, or **Itenez**, river, South America, rises in the western part of Brazil, flows n. past Matto Grosso, and forms the boundary between Brazil and Bolivia, till it unites with the Mamoré and falls into the Madeira. Length, 1,000 miles.

**Guarana**, or **Brazilian Cocoa**, a medicinal preparation derived from the seeds of a South American tree, *Paullinia sorbilis*. These seeds contain an alkaloid, 'guanine,' identical with caffeine. Guarana contains about twice as large a proportion of caffeine as coffee, and has also a large percentage of tannin. It is used as a beverage in parts of South America.

**Guarani**, the most widespread of the South American aborigines, whose domain originally comprised a great part of Central and Southern Brazil, Paraguay, Bolivia, Argentina, and Uruguay. Jointly with the kindred Tupi, they constitute the Tupi-Guarani family, which further occupied most of the eastern seaboard s. of the Amazon estuary, and reached inland to the eastern slopes of the Peruvian Andes.

**Guarantee**, or **Guaranty**, an obligation, usually created by contract, whereby one becomes responsible for the debt, default, or miscarriage of another. The obligation may be absolute, or it may be conditional on the failure of the principal debtor to discharge the obligation himself. Formerly a contract of guaranty was equally binding whether oral or written, but by the Statute of Frauds such a contract, unless construed to be an independent agreement, must be in writing and signed by the party to be charged therewith or his authorized agent. See SURETYSHIP.

**Guaranty Companies**. See Title **Guaranty Companies**.

**Guaranty Deposit Law**. See BANKING.

**Guarayos**. South American aborigines, of Tupi linguistic stock, who roam the forests of Eastern Bolivia.

**Guardafui**, **Cape**, the n.e. extremity of the 'eastern horn of Africa,' at the southern entrance to the Gulf of Aden.

**Guardian**, one having lawful custody and control of the person or property, or both, of an infant. The *natural* guardian of a minor's person and estate is the father; failing him, the mother. The judicial decree which, in the event of the divorce or separation of husband and wife, awards the custody of a child to either parent constitutes such parent the child's guardian. Ancient forms of guardianship have been abolished, and now, in default of natural guardianship, a guardian may be appointed by deed or will of the natural guardian or by decree of the court. A guardian is a trustee in effect, and like a trustee can be called to account by his ward. See PARENT AND CHILD.

**Guards**, a military term designating certain picked regiments or corps forming the personal guard of the sovereign. In the British army there are two regiments of Life Guards, the Royal Horse Guards, and four regiments of Foot Guards. A famous regiment of guards was the Swiss Guard, formed in France in 1616, which was massacred in defending Louis xv. in the Tuileries (1792).

**Guárico**, inland state, Venezuela, formed in 1904 from a part of the state of Miranda, from which it now lies s. Area 25,000 sq. m.; p. about 125,300. The capital is Calabozo.

**Guarini, Giovanni Battista** (1537-1612), author of the celebrated drama *Il Pastor Fido*, was born in Ferrara. He was a contemporary of Tasso, and his book is a brilliant work, reflecting the manner of life, vices, and superficialities of the age.

**Guarneri, Guarneri, or Guarnerius**, the surname of an eminent Italian family of violin makers who worked at Cremona. GIUSEPPE ANTONIO (1683-1745), a nephew of Andrea, popularly known as Guarneri del Gesù, because of the letters 'I. H. S.' written on many of his labels, was the most famous and his violins, which date from 1740 to 1745, are considered by many to equal the best productions of Stradivari.

**Guastalla**, town and episcopal see of Italy, province Reggio Emilia, on the Po. Here the Franco-Sardinians defeated the Austrians in 1734; p. (commune) 12,000.

**Guatemala**, the northernmost of the republics of Central America, is bounded on the n. and w. by Mexico, on the s. by the Pacific Ocean, and on the e. and s.e. by British Honduras, the Gulf of Honduras, Honduras, and Salvador. It has a total area of 48,290 sq. m., and a coast line of about 270 m. The surface presents great variety, with extensive plateaus, terraces, and land valleys.

The main chain—the Sierra Madre—runs generally parallel with the Pacific coast, which it approaches within 50 m.; on this side the slope is steep and broken by many volcanoes, while towards the Atlantic it sinks in gentle incline, with subsidiary ranges extending to the water's edge. The great northerly plateau of Petén comprises nearly one-third of the area of the republic. Most of the volcanoes of the Sierra Madre region are extinct, but Fuego and Pacaya are active. The highest peaks are Tajumulco (13,800 ft.) and Tacana (13,300 ft.).

The rivers flowing from the steep Pacific slope of the Sierra Madre range are short and torrential; but on the Atlantic slope the Montagua and Polochic attain a length respectively of 250 and 180 m. The climate varies from the hot coastal and northern lowlands to temperate plateaus and the mountainous districts at an altitude above 6,000 ft. Earthquakes are frequent. The average rainfall, especially on the Atlantic slope, is copious. The soil is very fertile and the country is heavily wooded. Mines of gold, silver, copper, iron, lead, zinc, and antimony exist in various sections of the country but have as yet been inadequately investigated. Forest products include valuable cabinet woods, notably cedar and mahogany, rubber, dyewoods, and chicle and other gums. The principal industry, however, is agriculture; the chief products being coffee, sugar, bananas, maize, and other cereals. The cattle industry is constantly developing and promises to be a profitable one.

The population of Guatemala is estimated at 2,454,000, of which number about 60 per cent. are pure Indians, and most of the remainder half-caste. The principal city is the capital Guatemala City or Guatemala la Nueva, which was completely destroyed by earthquakes in 1917 (120,707). The law-making power is vested in a National Assembly elected by universal suffrage for four years, and a Council of 13 members. The presidential term is six years, after which reelection is barred for 12 years. This restriction was embodied in the revised constitution which came into effect on Jan. 1, 1928.

Guatemala was conquered in 1524 by the Spaniards. After three centuries of harsh rule, under which the vice royalty of Guatemala embraced all that is now known as Central America, independence was proclaimed, September 15, 1821. A confederation survived with difficulty from 1824 to 1839, but fell before the attacks of the Indian Ra-



fael Carrera, who founded the present republic, and reigned over it until his death in 1865. Under General Barrios, president from 1871 to 1885, monastic orders were rigorously suppressed and much of the church property was confiscated and appropriated to the uses of public education and for other purposes. A civil war which broke out in March 1906 was quelled a few months later by the intervention of the United States and Mexico. On March 15, 1917, President Manuel Estrada Cabrera was inaugurated for his sixth term of office (1917-23), but was turned out by a revolution in 1920, after a 22 years' dictatorship. Owing to the serious illness of President Chacón in December, 1930, the second Presidential designate, Baudillo Palma, was vested with executive powers. Four days later (Dec. 17) a coup d'état overthrew Palma and installed General Orellana as Provisional President. In 1937, General Jorge Ubico became President. In 1938 a treaty was concluded settling the boundary with El Salvador.

Guatemala declared war on Germany and the Central Powers in World War I and in 1941 again joined the U. S. in World War II as a declared enemy of Ger., It., and Jap.

**Guatemala Antigua** (old Guatemala), former capital of Guatemala, lies 15 m. s.w. of Guatemala la Nueva. It was originally founded by the Spaniards on the n. slope of the Volcano del Agoa, but was destroyed by an outburst in 1541. Having been rebuilt near the same site, it was almost totally destroyed by earthquake in 1773, and again in 1874; p. 6,000.

**Guatemala la Nueva**, city, capital of the republic of Guatemala, is situated on a wide plateau 4,900 ft. above sea level; 72 m. by rail n.e. of its port, San José. The town was founded in 1776 after the destruction by earthquake of Guatemala la Antigua. A series of six terrific earthquakes from December, 1917, to February, 1918, destroyed the new city, but it has been rebuilt about 12 m. s. of the destroyed one; p. about 120,707, mostly of European origin.

**Guatemotzin, Guatemoc, or Cuauhtemoc** (c. 1497-1525), the last Aztec sovereign of Mexico, nephew of Montezuma II., ascended the throne on the death of Cuiclahuatzin, in 1520. He took the field against the invading Spaniards—defending the city of Mexico against Cortez in 1521, and, after the fall of the city, was captured. He was taken as hostage on the march of the Spaniards across Honduras, during which he was executed.

**Guatusos, Huatusos**, a tribe of Central American aborigines, southernmost branch of the Chorotegan family, whose territory is in Costa Rica. They are a peaceful agricultural people.

**Guava** (*Psidium guayava*), a low-growing West Indian tree belonging to the family Myrtaceæ. It bears white flowers, followed by fragrant yellow, fleshy fruits, extensively employed for the making of preserves and jellies. The guava also grows in the East Indies; and there is a Chinese variety, *P. cat-tleianum*, the strawberry guava.



*Guava and Fruit.*

**Guaviare**, river, Colombia, South America, rises in the Andes near Bogotá, and flows e. for over 700 m. to join the Orinoco. It is navigable for small vessels for 600 m.

**Guayama, Guyama**, town, department of Guayama, Porto Rico; 4 m. n.e. of the harbor of Jobos. It is in a cane-growing district, and has sugar-manufactures; p. town, 8,321; municipality, 17,379.

**Guayaquil**, chief port and most important town of Ecuador, South America, capital of Guayas province, is situated on the River Guayas, 30 m. above the point where it empties into the Gulf of Guayaquil. Noteworthy features are the Cathedral (1730) customs house, government buildings, bishop's palace, university, hospitals, and commercial and technical schools. Panama hats, ivory nuts, cacao, coffee, chicle, quinine, gold, silver, cotton, rubber, tobacco, and hides are exported; p. 120,000.

**Guayaquil, Gulf of**, an inlet of the Pacific Ocean, in Ecuador, the only important break on the western coast of South America n. of Chile. There are two entrances—one on either side of the island of Puna.

**Guayas**, river, Ecuador, rises in the Andes and flows s.w. for about 200 m. to the Gulf of Guayaquil. It is the high road for the

commerce of Guayaquil, being navigable for small vessels to that city.

**Guaycurus**, a tribe of South American aborigines, chiefly in the Gran Chaco. They are probably of Guarani stock.

**Guaymas**, harbor and seaport, Sonora state, Mexico, on the Gulf of California. Silver ore and sulphate, coined silver, and hides, are exported; p. 9,000.

**Guayule**, or **Huayule**, a rubber plant (*Parthenium argentium*) indigenous in Central Mexico. Rubber occurs in a solid state in the cells of the bark and in the roots.

**Gubbio**, market town and episcopal see, Umbria, Italy, 20 m. n.e. of Perugia. It possesses a 13th-century cathedral, the imposing Palazzo dei Consoli (14th century), and a museum which contains the Eugubine Tables. It represents the ancient *Iguvium*, and was formerly famous for its majolica; p. 28,000.

**Gudgeon**, in Europe a cyprinoid fish related to the barbel; in the United States, the name for certain varieties of minnow.

**Gudrun**, or **Kudrun**, old German epic, embodies the legends of the North Sea shores among the Hegelings (Frisians).

**Guelder Rose**, or **Snowball Tree**, a cultivated form of the genus *Viburnum*, especially *V. opulus*, with flat cymes of white flowers in summer, and red, globose fruit. The double variety, *V. O. sterilis*, is the common garden form.

**Guelf** and **Ghibelline**, terms derived from the names of two German princely houses—the Welf and Waiblingen—who struggled for the imperial dignity in the early part of the 12th century. Frederick of Hohenstaufen, the Waiblingen, was successful. The Ghibellines were chiefly found among the feudal German landowners, while the Guelfs were the Latin dwellers in the Lombard and Tuscan towns who struggled for independence, though other Italian cities—e.g., Pisa, Lucca, and Arezzo—were imperialist. The Guelf towns formed an alliance with the papacy, and for a century struggled with Frederick, his son Henry VI., his grandson Frederick II., and the latter's illegitimate son Manfred. After many defeats, they were ultimately victorious, when Charles, Count of Anjou, was called upon to aid the Guelfs against Manfred (1266). From the house of Guelf, through the dukes of Saxony and of Brunswick-Lüneburg, is descended the house of Hanover, which from 1714 to 1901 was the reigning family of Great Britain.

**Guercino**, Il (i.e. the squint-eyed) the

nickname of GIOVANNI FRANCESCO BARBILRI (1590-1666), an Italian artist, who was born in Cento, Ferrara. In early life he was doubtless influenced by Caravaggio, but later he tried, rather unsuccessfully, to imitate Guido Reni. His chief works are frescoes in the cathedral at Piacenza, pictures in Rome and Bologna, in the Pitti Palace at Florence, and the National Gallery, London. His drawings were engraved by Bartolozzi.

**Guericke, Otto von** (1602-86), German physicist, was born in Magdeburg, of which place he was burgomaster from 1646 to 1681. He made notable discoveries on the nature of air and electricity, also in astronomy, the chief of which are found in his *Experimenta Nova* (1672; new ed. 1881). He invented the air-pump (1650), and made a crude barometer and an electric machine. He also wrote an account of the great siege by Tilly, *Geschichte der Belagerung. . . . Magdeburgs* (1631).

**Guerilla Warfare**, a species of petty hostilities (*guerilla* is the diminutive of *guerra* = 'war') carried on by bands of men who are loosely organized as soldiers, but often subsist mainly by plunder.

**Guérin, Eugénie de** (1805-48), French authoress, sister of Georges Maurice de Guérin (1810-39), was born near Albi. Both were mystics of a high order; but while he was akin to the great pagans, she finds her place among the saintly Catholics. After her brother's death she devoted herself to collecting and publishing his *Reliquiae* (ed. G. S. Trébutien, 1860). Her *Journals and Letters* (1862; Eng. trans. 1865) reveal a beautiful nature.

**Guerin, Jules** (1866- ), American artist, was born in St. Louis, Mo. He studied with Benjamin Constant and Jean Paul Laurens and was the director of color and decorations for the Panama Exposition. He executed decorations for the Lincoln Memorial Building, Washington, D. C., for the Federal Reserve Bank in San Francisco, Cal., for the Pennsylvania Station in New York City, and for many other public buildings. He is a member of the National Institute of Arts and Letters.

**Guernsey**, second largest of the Channel Islands, 25 sq. m. in area, lies 110 m. s. of England. The highest point reaches only 350 ft. above sea-level. It is famous for its cattle. There is a good port at the chief town St. Peter Port, where Victor Hugo resided from 1852 to 1870. Administratively, Alderney, Sark, and Herm, with a combined area of about 3 sq. m., belong to Guernsey; p. of

Guernsey, Alderney, and the smaller isles 42,606.

**Guernsey, Egbert** (1823-1903), American homœopathic physician, was born in Litchfield, Conn. In 1848 he founded, and for the next two years edited, the *Brooklyn Daily Times*. He also founded (1870) and edited the *Medical Times*, was associated with the New York Homœopathic Medical College, and in 1870 established the Western Dispensary, now a part of the Hahnemann Hospital. He wrote *Domestic Practice* (1855), and also a school history of the United States, once widely used.

**Guernsey Lily** (*Nerine sarniensis*), a beautiful bulbous plant, belonging to the order Amaryllidaceæ. It bears many-flowered scapes of pink flowers in autumn.

**Guerrazzi, Francesco Domenico** (1804-73), Italian author and statesman, was born in Leghorn. Constantly engaged in republican conspiracies, he was imprisoned at Porto Ferrajo, Elba, where he produced his historical novel, *L'Assedio di Firenze* (1836), his most important work. His other works include *La battaglia de Benevento* (1829), *Apologia della Vita Politica di Guerrazzi* (1851), *Memorie* (1848), and *Vita di Andrea Doria* (1863).

**Guerrero**, state, Mexico, in the s. w. part, bordered by the Pacific and enclosed by the states of Michoacan, Mexico, Morelos, Puebla, Oaxaca; area, 64,756 sq. m. It is crossed by the Sierra Madre del Sur. The state is mountainous and fertile, yielding grain, coffee, tobacco, fruits, cotton, and sugar. It is exceedingly rich in minerals, copper, opals, topazes, and coal, but thus far they have been but little exploited. The inhabitants are mainly Indians. Chilpancingo is the capital; Acapulco is the seaport; p. 637,530.

**Guerrero, Vicente** (1732-1831), Mexican revolutionist, was born in Tixtla. He opposed the seating of President-elect Pedraza on the ground that the election had been fraudulent, and had himself elected by Congress (1829), but was obliged to abdicate, and was finally captured and shot. During his administration a decree was passed abolishing slavery.

**Guesclin, Bertrand du** (c. 1320-80), Constable of France, was born in Brittany. He was distinguished in youth by his prowess in all contests of strength and skill; defended Rennes against the Duke of Lancaster (1356-7); and subsequently conducted the defence of Dinan, but was taken prisoner by Sir John Chandos in 1364. Released on a

heavy ransom, he proceeded to Spain, where he fought for Henry of Trastamare against Pedro the Cruel, and in 1367 was taken prisoner by Edward the Black Prince. Once more ransomed, he became Constable of France in 1370, and thenceforward fought against the English.

**Guess, George.** See *Sequoia*.

**Guest, Edgar Albert** (1881- ), American author, was born in Birmingham, England. Since 1895 he has been connected with the *Detroit Free Press* and now conducts a column of verse and humor. His published works include *A Heap o' Living* (1916); *Just Folks* (1917); *Rhymes of Childhood* (1924); *The Light of Faith* (1926); *Harbor Lights of Home* (1928), etc.

**Guest, John** (1821-79), American naval officer, was born in Missouri. In the Mexican War he saw active service on the frigate *Congress*, and again in 1854. In the Civil War he served on the Union side at Fort Jackson and Fort St. Philip, at Vicksburg and at Fort Fisher. In 1873 he was made a commodore, and ended his career as commandant of the Portsmouth Navy Yard.

**Guetarda**, a genus of evergreen tropical American trees and shrubs belonging to the order Rubiaceæ. They are quite ornamental and are grown in hothouses, both for their foliage and salver-shaped flowers.

**Gueux, Les, or Beggars of the Sea**, the appellation of certain of the patriot party of the Netherlands in their struggle against Spain in the 16th century. One body of the Gueux, who became known as the Beggars of the Sea, fitted out privateers, and under the leadership of Count de la Marck harassed Alva's communications, and by their capture of Brill (1572) they won the first success in the struggle which eventually resulted in the independence of the Netherlands. Consult Motley's *Rise of the Dutch Republic*.

**Guevara, Antonio de** (1480-1545), Spanish ecclesiastic and philosopher, bishop of Mondoñedo, was born in Santander. He joined the Franciscans and later became confessor and chronicler of the Emperor Charles v. His didactic writing had a remarkable vogue throughout Europe, being in respect of its affected and bombastic style the forerunner of the 'euphuism' of the English writer Lyly. His *Relox de principes de Marco Aurelio* (1529), which had an extraordinary success, was translated into English (*Golden Book of Marcus Aurelius*) by Lord Berners

(1534). Consult Hume's *Spanish Influence on English Literature* (1905).

**Guffey, Joseph F.** (1875- ), United States Senator from Pennsylvania (1935-1941) elected as a Democrat supporting the Franklin D. Roosevelt Administration. Member of War Industries Board during World War, officer and director of utilities and oil companies in Pennsylvania. In the Senate he introduced a measure enacted to effect government regulation of the soft coal industry.

**Guggenheim, Simon** (1867-1941). American legislator, was born in Philadelphia. He was educated in public schools, and studied in Europe, later engaging in the mining and smelting industry in the U. S. and Mexico. In 1907 he was elected to the United States Senate where he served for the term 1907-13, declining to be a candidate for re-election. In 1925 in memory of their son, he and his wife established the John Simon Guggenheim Memorial Foundation for scholarships for advanced study abroad.

**Guiana.** See **British, Dutch, and French Guiana.**

**Guicciardini, Francesco** (1483-1540), Italian historian, born at Florence. Interesting himself in the affairs of Florence, he acted as councillor to Duke Alexander, gaining for him the favor of Charles v.; and after the assassination of Alexander he secured the election of Cosimo de' Medici (1536).

**Guides** are officers, or non-commissioned officers in an army, whose duty is to regulate the direction of the march or the pace to be observed. Ordinarily this duty falls upon the sergeants of a company, who are spoken of as guides. The term is used in a broader sense to designate certain corps in European armies, to whom is given the duty of leading troops through strange territory.

**Guido d'Arezzo**, or **Guido Aretinus** (990-1050), a Benedictine monk, born probably near Paris, who made many reforms in musical notation, and to whom many others are wrongly attributed. He probably invented the principle upon which the stave is based; and at Pomposo, near Ferrara, taught the new method with great success. He wrote numerous works (ed. Gerbert, 1784), explaining his improvements, including *Micrologus*, the *Antiphonarium*, and *De Artificio Novi Cantus*.

**Guido Reni** (1575-1642), Italian painter, born at Calvensano, Bologna. Guido's early works have an imposing, almost violent character, resembling the manner of the naturalistic Caravaggio. Some of his best works

in this class are the *Crucifixion of St. Peter*, in the Vatican; the *Madonna della Pietà*, the *Crucifixion*, the *Massacre of the Innocents*, at Bologna; and *St. Paul the Hermit and St. Anthony in the Wilderness*, in the Berlin gallery. While in Rome he adopted a style remarkable for its softness and grace. The chief works belonging to this period are the large fresco in the garden pavilion of the Rospigliosi Palace at Rome, which is generally considered his masterpiece; and the *Nativity*, in the choir of S. Martino at Naples.

**Guienne** or **Guyenne**, former prov. of France, watered by the lower Garonne and Dordogne. With Gascony, it was the ancient Aquitania, of which Guienne is a corruption. By the marriage of Henry II. of England with Eleanor of Aquitaine (1152) Guienne became English, but reverted to France at the end of the Hundred Years' war.

**Guild.** A mediæval voluntary association for mutual assistance. The guilds do not owe their origin to the church, although down to the 12th century they were mainly religious in character, many remaining so till they were suppressed in 1547, at the reformation in England. The guild was, however, industrial or commercial in scope. The guild proper consisted of two entirely distinct bodies—the 'guild merchant' and the 'craft guilds.' The guild merchant was the earlier to appear. The chief privilege was that the member of such a guild had within its jurisdiction the monopoly always of retail trade. There was in England no struggle between the craft and the guilds. In Scotland, on the other hand, in the 15th and early 16th centuries, there was a keen struggle between the two bodies; and on the Continent a similar struggle for supremacy was in most of the 'free cities' embittered by efforts to secure democratic government. The craft guilds from the 14th century usurp attention. Their object was the regulation of the trade in the interests of the workers. But the spirit of monopoly exercised its baneful influence. Out of the decaying craft guilds there grew two sets of institutions—journeymen's guilds, in which it has been claimed that the modern trade union has its origin; and the companies of capitalist employers, which survived the decay of the guild system, and became in London the Livery Companies. See Gross's *Gilda Mercatoria* (1883; with bibliography, 1890); Welford's *Gilds, their Origin, Constitution, etc.* (2d. ed. 1888); Brentano's 'History and Development of Gilds,' contained in Smith's *English Gilds, their Statutes and Customs*

(1870); Lambert's *Two Thousand Years of Gild Life* (1892); and St. Martin's *Histoire des Corporations de Métiers* (1897).

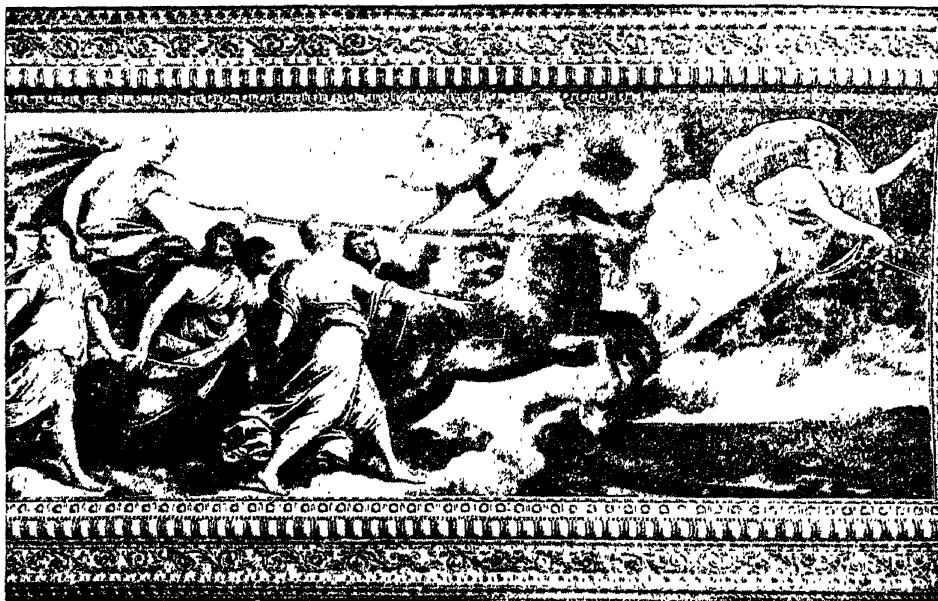
**Guildford**, munic. bor. and co. tn. of Surrey, England, 30 m. s.w. of London. The church of St. Mary, built of flint and chalk, contains curious frescoes. The town hall dates from 1683, a free grammar school from 1509, and a hospital for aged persons, founded by Abbot, archbishop of Canterbury from 1619. The principal object is the Norman keep of the old castle. During the Plantagenet period it was an occasional royal residence; p. 23,823.

**Guildhall**, an edifice in the city of Lon-

cellar for several days. Fitz-Greene Halleck was born and lived here for several years; p. 3,544.

**Guilford Court House**, battlefield, Guilford co., N. Carolina. Here, March 15, 1781, was fought a battle between 2,213 British, under Cornwallis, and 4,400 Americans, under Greene. The battle has been claimed as a strategic victory for the Americans, because Cornwallis was so much weakened by his losses that he had to retreat from the Carolinas.

**Guilielma**, a genus of tropical American palms, with hairy, feather-like leaves, and spiny trunks and leaf stalks.



Fresco by Guido Reni—'Aurora.' In Rospigliosi Palace, Rome.

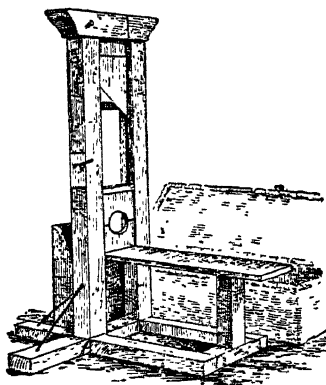
don, long identified with civic conclaves, and with the feasts of the corporation. Price's *Guildhall* (1886) outlines its past history and architectural vicissitudes. It was involved in the great fire, and the edifice as it now stands dates only from 1789. In a general sense guildhall means the hall in which the guilds or corporations usually assemble—the town or corporation hall.

**Guilford**, bor., New Haven co., Conn. It was settled in 1639. A stone house built in that year is still standing and is a state museum. Here, in 1660, the regicides, Goffe and Whalley, are said to have given themselves up to the governor of New Haven colony, and to have been hidden by him in his

**Guillemots** are members of the auk family. The common guillemot (*Uria troile*) breeds on all rocky coasts of the North Atlantic. All the guillemots lay only a single pear-shaped egg on the ledge of a seaciff. They make no nest whatever, and large colonies brood in company.

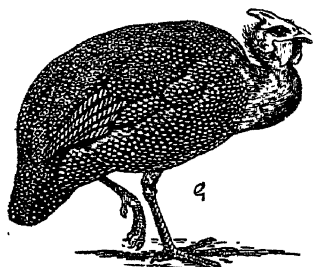
**Guillotine.** (1.) An instrument employed for the purpose of decapitation; was officially introduced into France, as the means of inflicting capital punishment, in April, 1792. It was named after its reputed inventor. The instrument consists of two upright posts held together at the top by a cross beam, the former being perpendicularly so grooved as to allow of the falling in a direct line of a

broad steel blade, whose edge is cut obliquely. The latter descends upon the neck of the criminal immediately that the cord which holds it up is released by the executioner. (2.) A machine, similar in name and in general construction to the above, employed by bookbinders. It is used for cutting paper and trimming the edges of books after the sheets have been sewn together.



Guillotine.

**Guimaras**, isl., Iloilo prov., Philippines, between Negros and Panay, 27 m. long, 12 m. wide. Important towns are Nagaba and Buenavista. There are anchorages at Igam Bay and Port Santa Ana on the w. coast. Produces rice, hemp, cotton, corn, tobacco, and has fishing industries; p. 21,306.



Guinea Fowl.

**Guinea**, an English gold piece, first struck in the reign of Charles II., for the most part from gold obtained in Guinea. It maintained its place as the principal English gold coin till 1817, when the sovereign was introduced. The value of the guinea varied from 30s. in 1695 to 21s. in 1717. Many payments are now made in guineas representing a value of 21s., although there is no current coin of the name.

**Guinea, French and Portuguese.** See **French Guinea** and **Portuguese Guinea**.

**Guinea, Gulf of**, on the w. coast of Africa, between Cape Palmas (s.e. of Liberia) and Cape Lopez. On the n. and e. are two open bays, known as the Bight of Benin and the Bight of Biafra.

**Guinea Fowl**, the African representatives of the pheasants, from which they differ in that the plumage of both sexes is alike. The origin of the domesticated stock is *Numida meleagris*, from W. Africa.

**Guinea Grass** (*Panicum maximum*) a perennial tropical W. African grass, highly esteemed in its native lands and in the W. Indies and southern United States as a fodder plant. It grows from eight to ten ft. in height.

**Guinea Pig**, a domesticated rodent. Probably it has arisen from Cutler's cavy (*Cavia Cutleri*), domesticated by the Incas of Peru. Guinea pigs were introduced into Europe by the Dutch in the 16th century. They are extraordinarily prolific and very hardy if kept in dry and warm situations. They are used extensively in bacteriological laboratories for investigations in experimental medicine, especially as regards germ diseases.

**Guinea-worm**, a round-worm (*Dracunculus medinensis*) parasite under the human skin, especially about the coasts of the Indian ocean, and the principal cause of the disease filariasis. See Cobbold, *Entozoa* (1864). See **FILARIASIS**.

**Guinegate**, or **Enguinegatte**, vil., dep. Pas-de-Calais, France, 10 m. from St. Omer. Here in 1479 the troops of Louis XI. of France were defeated by Maximilian, Archduke of Austria, and in 1513 Henry VIII. of England and Maximilian defeated the French. The latter battle is called 'the Battle of the Spurs.'

**Guines**. Tn., dep. Pas-de-Calais, France, 6 m. s. of Calais; has trade in butter and eggs. Close by took place, in 1520, the meeting in the 'Field of the Cloth of Gold,' between Henry VIII. of England and Francis I. of France; p. (1901) 4,157.

**Guinevere**, wife of King Arthur. The Welsh *Triads* know three ladies of this name, each of whom was wife to Arthur; and the *Merlin* relates that the queen had a half-sister of the same name, born out of wedlock, who closely resembled her. At a comparatively late stage of Arthurian evolution Guinevere was provided with a new lover in the person of Lancelot, who is not mentioned in the earliest documents, and this *liaison* became the central point of Arthurian romance

in its latest development. The writings of Malory and Tennyson have made this story familiar. See LANCELOT DU LAC.

**Guiney, Louise Imogen** (1861-1920), American poet and essayist, born Boston. Some of her better known volumes of poetry are: *Songs at the Start* (1884); *The White Sail and Other Poems* (1887); and *The Martyr's Idyl, and Shorter Poems* (1899). Her prose includes: *Goose-Quill Papers* (1885); *Monsieur Henri; a Foot-Note to French History* (1892) and *Patrius; a Collection of Essays* (1897).

**Guingamp** (anc. *Gicampum*), tn., dep. Côtes-du-Nord, France. 18 m. w. of St. Briec. From the 14th to the 17th century it was the capital of the duchy of Penthievre. The mediæval church of Notre Dame de Bon Secours is a much-frequented place of pilgrimage. The town gives its name to gingham, which is still manufactured; p. 9,252.

**Guinicelli, Guido** (c. 1230-76), Italian poet, was born at Bologna. He began by imitating the Provençals and Sicilians; but later his thought deepened, and his poetry became remarkable for the beauty of the images employed. By Dante he was esteemed as the father of Italian poetry. He founded a school of poets at Bologna. His best known poem is *The Gentle Heart*, of which there is a good translation by D. G. Rosetti.

**Guipuzcoa**, prov. N. Spain, one of the Basque provinces. It is mountainous, produces maize, timber, cattle, etc., and has factories of paper and matches. Its capital is San Sebastian. Area, 728 sq. m.; p. 278,166.

**Guiraud, Ernest** (1837-92), French musical composer, born at New Orleans, La.; won the Grand Prix de Rome at the Paris conservatoire, the successful piece being *Bajazet et le Joueur de Flûte* (1859). His first opera, *Le Roi David*, was produced at New Orleans in 1852. His operas include *Sylvie* (1864), *Le Kobold* (1870), *Madame Turlupin* (1872), *Galante Adventure* (1882), and *Frédégonde*, completed by Saint-Saëns (1895).

**Guiraut de Borneil** (c. 1138-c. 1220), Provençal troubadour, known as 'master of the troubadours,' was born at Excideuil (Dordogne). He accompanied Richard Cœur de Lion on the third crusade. He wrote many tender love poems in honor of a Gascon lady—some eighty poems in all. Only a few of these have been edited critically—e.g. by Kolsen (1894).

**Guiscard, Robert** (c. 1015-85), Duke of

Apulia and Calabria, was a son of the Norman Tancred de Hauteville, and was born near Coutances in Normandy. Proceeding to Italy while still young, he was made Duke of Apulia in 1056, and even opposed successfully Pope Gregory VII. (1073-81). He stormed and plundered Rome, freed the Pope from the castle of San Angelo (1084), and took him to Salerno for safety. Then returning to the east, he defeated the fleet of the allied Byzantines and Venetians near Corfu in 1085.

**Guise**, tn. and health-resort in dep. Aisne, France, on the Oise, 25 m. n. of Laon; has ancient church and ruined castle, the former seat of the dukes of Guise; p. 9,000.

**Guise**, a French noble family, originating in Lorraine. (1.) CLAUDE (c. 1406-1550), its founder, fifth son of René II., Duke of Lorraine, accompanied Francis I. in his Italian campaign, later winning distinction in Flanders and elsewhere. His daughter married James V. of Scotland, and was mother of Mary Queen of Scots. Originally Count of Guise (in Picardy), he was created duke in 1527. (2.) FRANCIS, second duke (1519-63), was lieutenant-general of France, and its virtual master for a number of years. He defended Metz (1552) against Charles V., and recovered Calais (1558) from the English. He was assassinated at Orleans.

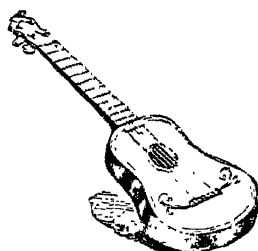
(3.) CHARLES, the famous cardinal of Lorraine (1524-74), his brother, was archbishop of Rheims at fourteen, and in 1547 cardinal. He administered the finances of France during three reigns, and introduced the Inquisition. (4.) HENRI, surnamed Le Blafé, third duke (1550-88), distinguished himself at Jarnac (1568) and Moncontour (1568) against the Huguenots. He superintended the massacre of St. Bartholomew in 1572, and was the head of the Catholic League, formed in 1576. In 1588 he was assassinated by the royal archers at Blois. (5.) HENRI, fifth duke (1614-64). On the overthrow of Masaniello at Naples, in 1647, he won the crown, but very soon lost it again. The house finally became extinct on the death of Marie, Duchess of Lorraine, in 1688, but the title is now borne by princes of the Bourbon-Orleans family.

**Guitar** (Span.), a musical stringed instrument related to the lute. While retaining the flat breast and large circular soundhole of the lute, it has a flat back, with bent sides, which in its modern form curve inward a little above the center. The guitar has six strings and is played by plucking the strings with the thumb and fingers of the right hand, while

[illegible]



the fingers of the left hand, by pressing the strings on a fretted fingerboard, regulate the pitch.



Guitar.

**Guian**, pueblo, on the s. coast of Is. of Samar, Philippine Is., on the harbor of the same name. Here is a good typhoon anchorage for vessels drawing 15 ft. The main export is coconut oil, which is produced in the vicinity. A United States garrison was established in 1902; p. 12,500.

**Guizot, François Pierre Guillaume** (1787-1874), French statesman and historian, born at Nîmes. On the fall of Napoleon he was appointed secretary-general of the interior in Louis XVIII's first administration, being promoted to the council of state (1816). He now came to the front as a leader of the party of the 'Doctrinaires.' In 1830 Guizot entered the Chamber; on the fall of Charles x. he was included in the first cabinet of Louis Philippe, and on its reconstruction (1832) became minister of public instruction. Here he became the true father of modern educational organization in France. Now began his rivalry with Thiers, and when the latter became minister for foreign affairs (1840), Guizot accepted for a time the post of French ambassador in London, where he was warmly welcomed by English society. But the same year he was recalled by the king, and entrusted with the task of forming a new ministry, which lasted for eight years. His chief works are *Histoire de la Révolution d'Angleterre* (2 vols. 1826-7; continued in 6 vols. 1850-6; Eng. trans. by A. R. Scoble, 6 vols. 1854-6); *Histoire de la Civilisation en Europe* (1828; Eng. trans. new ed. 1896); *Histoire de la Civilisation en France* (5 vols. 1829-32; Eng. trans. 1846); *Histoire de France Racontée à mes Petits-Enfants* (5 vols. 1870-5); *Vie, Correspondance et Ecrits de Washington* (1840; Eng. trans. 1840). See his own *Mémoires pour servir à l'Histoire de mon Temps* (9 vols. 1858-68; Eng. trans.

same dates); Jules Simon's *Thiers, Guizot, etc.* (1885); and Bardoux's *Guizot* (1894).

**Gujarat, Gujrat, or Guzerrat.** (1.) Maritime prov., Bombay, India, comprising the Kathiawar peninsula, Baroda, and other native states. It is crossed by the Vindhya and Satpura Mts., and is drained by the Narmada and Tapi. Its products are cotton, rice, wheat, maize, and tobacco. Total area, 70,038 sq. m.; p. 11,270,314. Excluding native states and agencies, the area is 14,400 sq. m., and the p. 4,361,666. (2.) Chief town of Gujarat district, Punjab, India, 75 m. n.w. of Lahore. The town is noted for its inlaid work in gold and iron, and for its manufacture of brass vessels; p. 19,410. The district, with an area of 41,536 sq. m., has a population of 750,548.

**Gulberga, Kulbarga, or Calburga, tn.,** Haidarabad, India, 110 m. w. of Haidarabad by rail. Successively a Hindu and Moham-medan capital, its main feature is the fort, with a citadel and a 13th-century mosque; p. 32,400.

**Gules**, in heraldry, is the color, or tincture, red.

**Gulf Stream**, oceanic current in the N. Atlantic, derives its name from the Gulf of Mexico. The chief cause of its existence is the heaping up of the waters of the warm equatorial current in the Gulf of Mexico. Thence they find their way out through the Strait of Florida as a strong, swift current, from 50 to 100 m. wide, 2,000 ft. deep, and with a speed of from two to five miles an hour. Proceeding north along the east coast of the United States, this current gradually spreads out, its rate of flow diminishing, and its mean surface temperature dropping from over 80° F. to about 73°. Off Newfoundland it merges into the great Gulf Stream drift, or general movement east of the surface waters of the Atlantic—a movement maintained principally by the prevailing west or south-west winds.

**Gulf Weed.** See *Sargasso Sea*.

**Gull**, a name applicable to the members of the sub-family Larinæ of the family Laridæ, which includes gulls, skuas, skimmers, and terns. Gulls are essentially marine birds, in spite of the fact that not a few species nest inland. Most of the familiar forms belong to the type genus *Larus*. A small one familiar on all northern coasts is the noisy Kittiwake (*L. tridactyla*). The large and handsome herring gull (*L. argentatus*) is widely distributed, and frequents in winter harbors far south of its present breeding range. The Pacific coasts have several peculiar species.

All gulls make very simple nests on sandy beaches, and lay about four heavily spotted eggs.

**Gullet.** See *Œsophagus*.

**Gum** is a term applied to a number of widely differing substances of a more or less sticky nature. The gums proper are almost entirely obtained from plants, and dissolve in water to a more or less perfect solution, and are hydrolyzed to sugars by boiling with dilute acids. The gum resins are also obtained from plants, and contain a certain amount of true gum, but are chiefly important on account of the resins and essential oils that are

**Gumbinnen**, town, Prussian province of East Prussia. An important battle took place here in 1914 during the World War, between Germany and Russia; p. 17,000.

**Gumboil**, an abscess in or near the socket of a tooth, generally due to dental caries.

**Gumming** (in vegetable pathology *GUMMOSIS*), a disease which attacks the plum, cherry, peach, and other stone fruit trees, often proving fatal to the limbs attacked and ultimately also to the whole tree in virulent cases. Observations seem to prove that the cause of the disease is a fungus named *Coryneum Beijerinckii*.

### THE GULF STREAM.

The arrows show the direction of the current, the feathers of the arrows its mean rate per hour. Each thick stroke above an arrow indicates 1 nautical mile, each thin stroke below an arrow indicates 1/2 nautical mile. Thus  $\rightarrow$  means 1 1/2 nautical miles.



present, and are insoluble in water. A solution of the commercial mixture known as dextrin, obtained by heating, or acting with acids, etc., on starch, is, like the true gums, largely used as an adhesive and thickening agent in calico printing, etc., taking the place of natural gums. Gums are also employed in pharmacy and bacteriology as vehicles and culture media. Chewing-gum consists principally of paraffin wax mixed with sugar and various flavoring ingredients; while the 'gums' given by oils when exposed to the air are oxidation products. See **RESINS**.

**Gumal (Gomul) Pass** crosses the Sulaiman range from 160 to 170 m. s.w. of Peshawar, and connects India with Afghanistan. Two important Afghan caravan routes converge at the pass.

**Gumti**, river of Northern India, rises in the United Provinces, and after a sinuous but generally southeasterly course of nearly 50 m. joins the Ganges about 25 m. below Benares.

**Gun.** See **Guns**; **Gun Making**; **Gunpowder**.

**Gunboat**, a small vessel armed with one or more heavy guns. With its light draught it is able to run close inshore or up rivers. Vessels of this type are now practically obsolete.

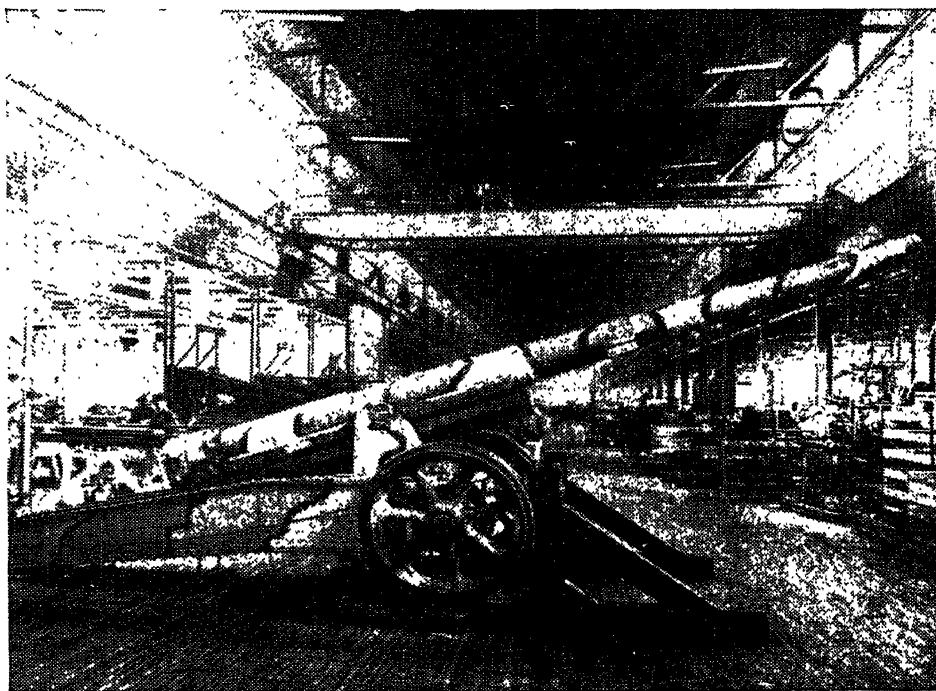
**Gun Carriage** is the structure in which a heavy gun or field gun is supported.

**Guncotton** is a powerful explosive produced by the action of strong nitric acid on ordinary cotton. It was discovered by P. L. Louze in 1838, but not fully developed or understood until Schönbein began his experiments.

ments with it, the result of which he published in 1846. It has been studied by a very large number of chemists, but they are far from agreeing as to its exact composition or chemical status. The simplest form of expressing the chemical formula for cotton (pure cellulose) is  $C_6H_{10}O_5$ , but it is variously given in multiples of this. The most highly nitrated form of guncotton is believed to be expressed by the formula  $C_{21}H_{15}O_{20}(NO_2)_{12}$ . This contains 14.14 per cent. of nitrogen (by weight). Ordinary commercial guncottons used for blasting rarely contain over 13 per cent., and consist of a mixture of higher and

higher grades. The nitration of the insoluble nitrocellulose is in excess of 12.75 per cent. Like the true guncottons, the friable cottons are insoluble in ether-alcohol. The dividing line is approximately 11.1 per cent. nitration. The true guncottons, while insoluble in a mixture of ether-alcohol, are soluble in acetone and other ketones, acetic ether (ethyl acetate), and many benzene compounds.

All varieties of nitrocellulose are produced by the action of nitric acid upon ordinary cotton. The character of the product depends upon the quality and condition of the cotton and the strength of the acid. Guncotton used



*Gun Factory, Interior.*

lower nitrations. Very highly nitrated nitrocellulose is insoluble in a mixture of alcohol and ether at ordinary temperatures, and by many authorities this, and this only, is designated as guncotton. Cottons of fairly high nitration, but soluble in ether-alcohol, are used in the manufacture of those gunpowders which contain no nitroglycerin. These and other cottons of somewhat less nitration are called collodion cottons, and are largely used in the manufacture of celluloid. Cottons of low nitration are called friable cottons, and are of very little use except in mixtures with

as a blasting or disruptive explosive is ordinarily stored in air-tight cases, and contains about 25 per cent. of water. If properly made it is, in the wet condition, the safest explosive known, the necessary care in handling being only such as will avoid injury to the metal containers. In this condition it is readily detonated by a fair-sized primer of dry guncotton set off by a fulminate exploder.

Both guncotton and collodion cotton may be collodized by evaporating the solvent after being dissolved. In this condition they resemble celluloid, gelatine, or glue, are nearly

insensitive to shock, and are not easily ignited except by a suitable primer, or hot flame. Commercial guncotton is usually a mixture of soluble and insoluble nitrocellulose. See EXPLOSIVES; GUNPOWDER.

Consult Munroe's *Notes on the Literature of Explosives* (in several volumes of *Proceedings* of the U. S. Naval Institute); Guttmann's *Manufacture of Explosives*; Walke's *Lectures on Explosives*; Eissler's *Modern High Explosives* (1906); *Ordnance and Gunnery* (U. S. Naval Academy, 1910).

**Gundelia**, a one-species genus of Asiatic composite plants. *G. Tournefortii* has thistle-like leaves and large, handsome purple flowers.

**Gun Making.** Modern heavy guns are no longer cast, but are 'built up' of forged steel. The parts are called the *tube*, *jacket*, *hoops*, *locking rings*, *trunnion rings*, *wire* (or *ribbon*) *winding*, etc. A gun is subjected to internal stress in two directions: that in the direction of its length is called *longitudinal stress*, and tends to pull the muzzle end away from the rear; the other tends to split the gun open in lines parallel to the axis of the bore, and is called the *circumferential* or *tangential stress*. These two stresses are brought about by the longitudinal and radial pressures of the powder gas. A third stress is the weight of the breech and muzzle, tending to make them droop.

The simplest method of making a gun is to cast it in one piece. This method sufficed as long as projectile velocities of less than 1,500 feet per second were acceptable. To get a greater velocity an increase of pressure became necessary, and it was then found that, if in the form of a tube, no metal, cast or forged, and no matter how thick, would stand a continued or frequently repeated pressure from within as great as the tenacity of a bar one square inch in section. In order to obviate this condition as far as possible, guns are built upon: the system of *varying elasticity*, in which the metal with the greatest elongation within its elastic limit is placed next to the bore; and (2) the system of *initial tension*, in which the outer surface is brought into a condition of tension so that it supports in some degree the inner surface under all conditions of pressure; moreover, the inner parts are slightly compressed, and until the internal gas pressure releases this compression the outer parts bear all the strain, and continue to materially assist at all times.

The utilization of the system of *varying elasticity* has not been found practicable in

high-powered guns, as other requirements of the metal of the tube are inconsistent with adequate extensibility within the elastic limit. All guns, therefore, are built upon the *initial tension* system. Of this system there are two methods in common use: the plain built-up gun, and the wire-wound gun, in which certain parts of the gun are wire wrapped. The material used in the manufacture of modern heavy guns is medium open-hearth carbon steel, or carbon steel with about three per cent. nickel. See GUNS.

**Gunmetal**, so called because of its use for the manufacture of ordnance before the introduction of steel for that purpose, is an alloy of copper (88%), tin (10%), and small quantities of zinc and lead.

**Gunnel** (*Centronotus*), a genus of coast fishes. One species (*C. gunnellus*), the spotted gunnel or butterfish, is common on British coasts, lurking under stones in tidal pools.

**Gunner, Naval**, in the United States Navy, is a warrant officer of the line or executive branch. He is the assistant to the ordnance officer, and under the direction of the latter looks after the ordnance equipment of the vessel.

**Gunnery** is the science and art of handling guns. The science consists of Gun Strategy and Tactics, Interior and Exterior Ballistics, and an investigation of the problems connected therewith. The art of handling guns consists of Drill, Target Practice, and allied problems. Gun Strategy and Tactics involve a study of the means of gaining all possible advantages due to methods of mounting and placing guns. Interior Ballistics treats of the phenomena occurring in a gun. Exterior Ballistics treats of the phenomena of the flight and impact of projectiles.

**Gunnison River**, Colorado, rises in the Cochetopa Mountains, and flows in the main n.w. until it meets the Grand River at Grand Junction.

**Gunnison Tunnel**, begun in February, 1905, and opened by President Taft in September, 1909, is an irrigation tunnel connecting the Gunnison River with the Uncompahgre. The waters of the Gunnison River are diverted from the Black Canyon, and devoted to the irrigation of an immense tract of fertile land in the south-west of Colorado which hitherto was dependent on the insufficient water supply of the Uncompahgre.

**Gunny Bags** are made of a coarse jute fabric, and are very largely exported from India to various parts of the world. American cotton is largely packed in these.

**Gunpowder** is the explosive used in guns to give the propelling force to projectiles. Three varieties have been in use—*black*, *brown*, and *smokeless*. The early history of *black gunpowder* is unknown. It is said to have been used by the Chinese several centuries before it became known in Europe, but there is no direct proof of this. It is probable that it was a development, not a discovery. As early as the 7th century an incendiary composition called 'Greek fire' was used in the navy of the Eastern Empire. Its composition was a secret, but according to many writers it consisted of salt, sulphur, pitch, rosin, and oil. Not far from Constantinople crude saltpetre and crude petroleum were to be found on the surface of the ground, so it is not unlikely that these two substances formed the 'salt' and the 'oil.' This combination was both inflammable and explosive.

The definite preparation of a dry powder was a development which produced the real gun. Its first mention as a powder is by Roger Bacon in the latter half of the 13th century. Experimental smokeless powders were tried as early as 1865. In that year, Colonel E. Schultze made a practicable *smokeless powder* by nitrating wood meal and adding potassium and barium nitrates. In Austria, between 1865 and 1870, Von Lenck achieved considerable success with guncotton powders in field guns. Unfortunately, these powders lacked keeping qualities. The next step was *brown* or *cocoa powder*. This contained less sulphur and more carbon; and the carbon was of wood which had been incompletely charred and not fully dehydrated. Brown powder gave even more residue in the gun than black powder, and nearly as dense a smoke. In 1887 the guncotton powder ('Poudre B') developed by M. Paul Vieille was adopted by the French government. This led to increased interest in the development of smokeless powders, so that within a few years all nations adopted one or more of the various forms.

In addition to blasting purposes, black powder is still employed in fireworks, shell charges, primer compositions, and ignition charges for smokeless powders. It is no longer used as the propelling charge in any military arms, and its use in shotguns is comparatively small. Existing *smokeless powders* are almost wholly of two types: (1) those composed solely of nitrocellulose, with or without a stabilizing agent; and (2) those composed of nitrocellulose and nitroglycerin, with the addition of vaseline, and, in some

cases, of small amounts of other substances. Consult Bernadou's *Smokeless Powders*; Cundill and Thompson's *Dictionary of Explosives*.

**Gunpowder Plot**, a conspiracy to blow up the British House of Parliament on Nov. 5, 1605, when King James I. was to open Parliament in person. A number of Roman Catholic country gentlemen seem to have been connected with it; but the ruling spirit was Robert Catesby, who had already suffered for the part taken by him in Essex's plot. Early in 1604 Catesby communicated his plan to John Wright and Thomas Winter. Guy Fawkes, a brave soldier serving in the Spanish army, was brought over from Flanders, and together with Percy was admitted to the plot after taking an oath of secrecy. All five then received communion from the hands of the Jesuit Gerard, who, however, was not informed of the conspiracy. On May 24, Percy hired a room adjoining the Parliament House which they intended to undermine. In December the digging was begun. The difficulties were greater than was expected, and it became expedient to call in the assistance of fresh associates. In the following March the conspirators were able to hire a convenient cellar immediately below the House of Lords. The mine was now abandoned, and the cellar was stored with casks of powder, covered with fagots.

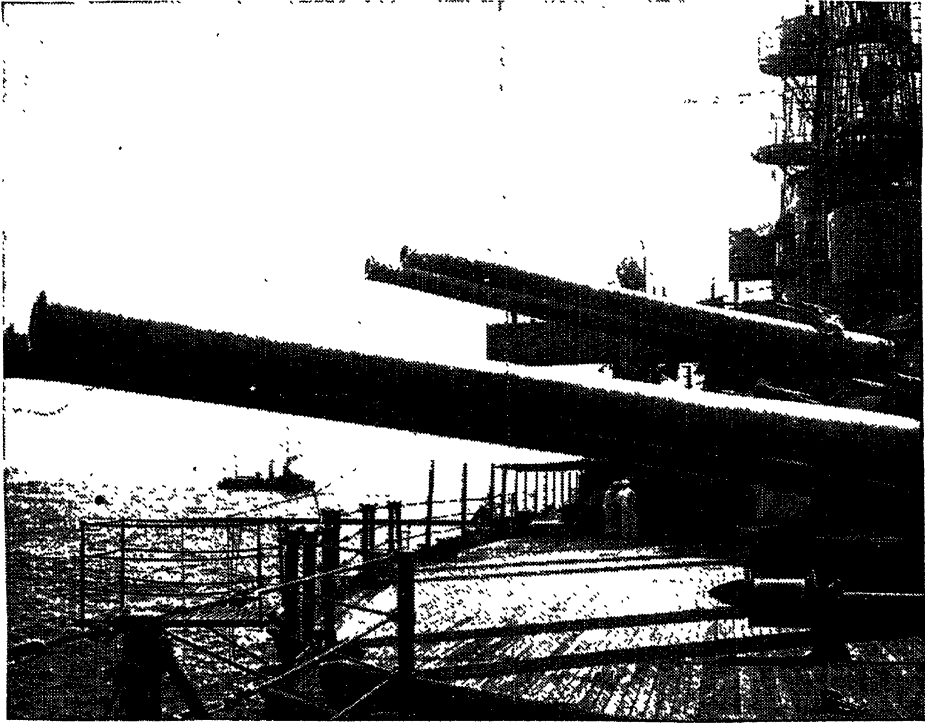
Wishing to save his friend Lord Montague, Francis Tresham, who had been induced to join the conspirators, wrote to him on Saturday, Oct. 26, a mysterious letter, which was shown to Lord Salisbury. The cellar was visited as if casually by the Lord Chamberlain and Lord Montague at three o'clock on the afternoon of Nov. 4. Fawkes, who was found there, explained that the fuel and fagots were the property of his master, Percy. On his return a little before midnight to the cellar to take up his post for the night, he was met and arrested at the doorway. Catesby hastened to Warwickshire, hoping to raise his friends. A few days later they were attacked; several of the conspirators, including Catesby, were killed, and others were taken prisoners and committed for trial. From their confessions the whole plot was gradually revealed. The government was now much concerned with a suspicion that the murderous design had been promoted or approved by the Jesuits. Bates had in his confession implicated certain fathers of the Society, especially Garnet and Greenway.

Their trial excited great interest. It is,

however, clear that the clergy in general, and the entire Catholic community, with the exception of a score of fanatics, were innocent. The plot is commemorated in the annual searching of the vaults below the Houses of Parliament, at the opening of the session, and by boys' processions on Nov. 5 carrying a scarecrow figure, representing Guy Fawkes with a dark lantern and matches, which is finally burned in a bonfire.

(1) Naval Guns; (2) Machine Guns; (3) Field Guns; (4) Siege and Seacoast Guns; (5) Gun Carriages.

(1) *Naval Guns*.—Until near the end of the 18th century, all naval guns were fired by means of a priming and a piece of match rope (slow match). In 1828 percussion locks were fitted to the guns of the U. S. S. *Van-dalia*, though they were not definitely adopted in the U. S. naval service until 1842, when



*Modern Naval Guns.*

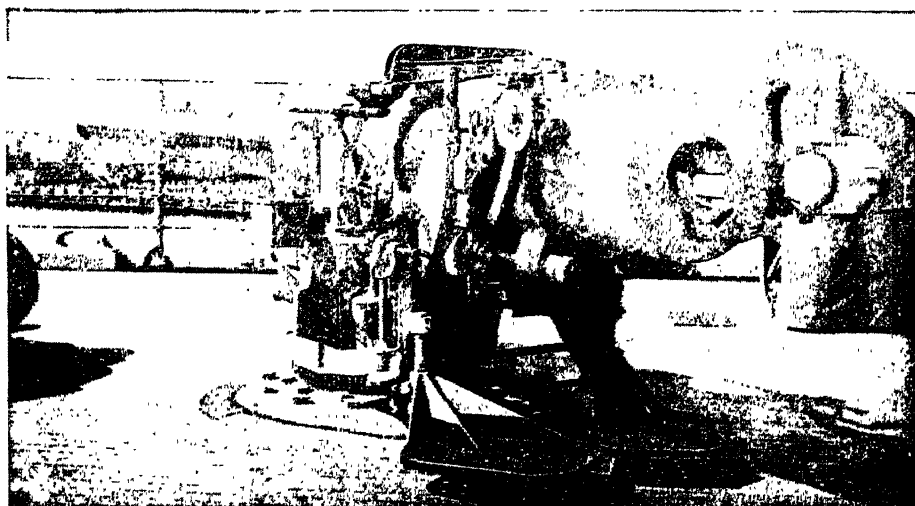
**Guns.** While this term may be held to cover all appliances consisting essentially of a metal tube so contrived as to discharge a projectile by means of an explosive, the present tendency is to limit its application to large ordnance, to quick-firing and machine guns, and to the sporting gun as distinguished from the military rifle. The historical development of large guns is given in the article **ARTILLERY**. *Small Arms*, or those guns which are intended to be carried and used in the hands, are treated under **FIREARMS**; **RIFLE**; **REVOLVER**. The *Sporting Gun* is treated under **FIREARMS**; **SHOOTING**. In the present article, the following divisions have been adopted:

Hiddon patented the hammer with the slot which permitted it to be drawn back clear of the vent after striking. The next important improvement was the development of the shell gun by General Paixhans, of the French army, about 1820. It was adopted by the French navy, and shortly afterward by other naval services. Paixhans predicted that shell guns would bring about the necessity for armor on ships, and his prophecy was fulfilled thirty years later. Armor (see **ARMOR PLATE**) in turn caused the development of the rifled gun, as an elongated projectile has much greater penetrative power per pound than a spherical one. The first breech loaders were

not satisfactory. Cavalli in 1845, Wahren-dorff in 1846, and Armstrong and Whitworth in 1854 brought out breech loaders of the sliding wedge type. From faulty design, or material of inadequate strength, a number of these guns gave way under trial; and all were unable to prevent the escape to the rear of some of the gas, and that rapidly injured the mechanism. Krupp's earlier pieces were muzzle loading, but in 1862 he exhibited in London his first cast-steel breech loaders. The success of the breech loader was assured by the invention of the Broadwell ring by an American army officer; this was adopted either as a loose ring or as a cup gas check

overcame the prejudices of legislators, steel makers and the press, far enough to get money for a built-up steel breech-loading gun. Even then they were compelled to build cast-steel guns to compete with it. The success of the forged-steel built-up gun was so decisive, however, as to settle the question forever.

The serious defects of black gunpowder as a propellant had long been appreciated. These were: too rapid burning (causing too quick a rise in pressure), the fouling of the bore, and dense smoke. The quickness with which the pressure reached a maximum strained the gun without giving a sustained pressure behind the projectile. The first at-



*U. S. Naval 8-inch Gun, with Breech Lock Open.*

by all makers; and modifications of it continued in use until De Bange invented the gas check pad, about 1880.

The United States Navy mounted the 11-inch Dahlgren smooth-bore guns in the large frigate of the *Niagara* class in 1854-5. They were much more powerful than any other guns afloat, and their very satisfactory performance during the Civil War blinded the great mass of the American people to their obvious defects, and to the superiority of the rifle. A few Parrott rifles were made and used during the Civil War, but accidents were frequent, and they were not popular. From 1865 to 1882 new construction in the United States ceased, both in the Army and in the Navy, because Congress refused to supply money for any species of armament. Finally, in 1882, the naval ordnance officers

tempt at correcting this consisted in an enlargement and hardening of the powder grains, and it effected some improvement, but not enough. About 1880 brown or cocoa powder appeared. It proved to be a successful propellant, as far as slow burning was concerned, and a marked increase of muzzle velocity was obtained with the same pressure; but the fouling continued. In 1887 M. Vieille brought out a nitro-cellulose powder, and this was followed by numerous others containing nitro-cellulose or nitro-glycerine or both. The new powders were not only more powerful, but they were comparatively smokeless, and were universally adopted. In 1881 rapid-fire guns were brought out, at first in calibres of 2.2 inches or less, but quickly increasing to 6 inches. The principle has now, in a measure, been extended to all

calibres, though only guns in which the ammunition can be easily man-handled still preserve the name. Guns of 5-inch calibre can be loaded, aimed, and fired at the rate of 15 shots per minute under favorable circumstances; 1.4-inch guns require 20 to 25 seconds per shot. Well-made built-up guns have a transverse elastic strength of about 25 tons per square inch, and an ultimate strength (before rupture would take place) of several tons more. As the maximum service pressure is only about 15 tons, the margin of strength is ample. This margin has been considerably increased in new U. S. guns by making the forgings of nickel steel, which adds to the strength and gives greater rigidity and less drooping of the muzzle in long guns. A recent development of fire control in battle is the 'director' method devised by Rear-Admiral Sir Percy Scott of the British navy. The guns are kept on the target by the gun pointers, and all are fired by the fire-control officer. Guns which are not on the target or not loaded are not fired.

(2) *Machine Guns*.—A machine gun is a water-cooled automatic gun which, because of the efficiency of the cooling system and the stability of the mount, is capable of accurate and long sustained fire at rates of 150 or more shots per minute, and this without any increase in dispersion that would endanger friendly troops over whose heads its fire may be directed. The first really practical machine gun was invented by Richard J. Gatling of Chicago, Ill., in 1862. This gun consisted of six barrels disposed around an axis; in order to fire, it was necessary to rotate a crank by hand. A few of these guns were used in the American Civil War and later in the Russo-Turkish war.

About the same time as the Gatling gun appeared the *mitrailleuse*, grape-shot, which was invented in Belgium. This gun consisted of a number of barrels—25 in one type and 37 in another—and differed in principle from the Gatling in that the barrels did not rotate. The mechanism was so arranged that all the barrels were fired simultaneously. It was used by the French in the War of 1870. Following the Gatling and *mitrailleuse* came the Gardner and Nordenfeldt type. The striking feature of these guns, as compared with their predecessors, was the reduction in the number of barrels. In order to fire either of these it was still necessary to operate a crank handle or lever by hand.

In 1833 Sir Hiram Maxim produced the first automatic machine gun. This gun is one

of the most remarkable inventions made, in that the first gun produced was practically perfect and did everything that its inventor claimed for it. The principle adopted was to use a single gun barrel and to mount it so that after each shot it recoiled in its mounting through a short distance, elongating a spring which brought it back to firing position at the end of the recoil. The double movements backward and forward ejected the fired cartridge and loaded up another in its place. Maxim devised a new kind of feed, the cartridge being held in clips in a belt which the action of the gun worked forward from right to left so as to bring a cartridge up to the loading position after each shot was fired.

Soon after Maxim had invented his automatic machine gun, which contained a single barrel, cooled by water, and which derived its motive power from recoil, Hotchkiss, a French inventor, produced a type of automatic machine gun which is air cooled and gas operated.

(3) *Field Guns*.—The modern field gun of all the principle powers is the rapid-fire long-recoil type. It differs from former types not only in its rapidity of fire—25 to 30 rounds per minute, depending upon the skill of the gun crew—but also in the fact that the gun recoils on the carriage; the recoil being checked and the gun returned to the firing position (in battery) by a recoil mechanism. This arrangement permits of rapid fire as after the first shot, which ordinarily seats the trail spade, there is practically no movement to the carriage and the gun once laid requires but little correction due to any movement of the carriage from firing. Guns are better classified according to the unit to which assigned, as this method of assignment controls the calibre to a certain extent. Such a classification is in use at present and we speak of guns as belonging to the Divisional Artillery, the Corps Artillery, or the Army Artillery. The Divisional weapons are the lighter guns and howitzers and the calibres increase in the corps and army artillery. Guns may also be classified according to their trajectories, *i.e.*, the path described by the projectile in its flight through the air. Under this classification we have the guns or flat trajectory weapons, howitzers or curved trajectory weapons, and mortars or high angle fire weapons. Each of these guns has its own use. Howitzers and mortars are to be preferred when the target to be attacked is protected by overhead cover, sheltered in trenches, or behind a relatively steep slope.



Guns are used when a flat trajectory is preferable, greater striking energy, and greater range than is possible for a howitzer of the same calibre.

The light field gun is the standard gun as, due to its relatively light weight, it is able to advance with the infantry and support it in attack or defence. All other guns are used to insure the success of an attack or campaign and as the success of every attack depends upon the success of the infantry it may be said that all guns except the divisional weapons are auxiliary to the division artillery. Such guns are used when the field gun or howitzer is not suitable due to lack of power or range. These auxiliary weapons are also used on occasions to increase the volume of fire of the divisional artillery. The American model has a calibre of 75 mm. or 2.953 inches. The gun is built of alloy steel forgings, consisting of a tube, jacket, breech hoop, and clip. All of the parts are assembled with shrinkage. The length of the gun is 84 inches and its weight 749 pounds.

**RAILWAY ARTILLERY.**—This term includes all types of artillery normally transported on special railway carriages. During the Civil War a few mortars were mounted on railway cars, and the British experimented with light guns so mounted in South Africa, but the recent development of railway artillery is entirely due to the World War. All nations engaged made extensive use of seacoast and naval guns mounted on railway carriages. The gun was mounted on trunnions which permitted about 40° elevation, but traverse was obtained by sliding the carriage along a curved track. The highest state of development of railway artillery has been reached in the United States, where railway carriages have been provided for cannon as large as the 14-inch, 50-calibre gun, and the 16-inch, 25-calibre howitzer.

(4) **SEACOAST GUNS**, being required in permanent fortifications for defence against attack by the most powerful warships, include some of the heaviest ordnance in use. In the United States, the system of coast defence is as elaborate and well developed as that of any nation in the world. All classes of guns, from the largest to the smallest, are included in the armament. For defence against battleships, 8-inch, 10-inch, 12-inch, 14-inch, and 16-inch guns, and 12-inch and 16-inch mortars are installed. The 16-inch gun and 16-inch mortar at present are the most modern standards of the major-calibre weapons. The latest 16-inch gun is a wire-wound gun, 67½

ft. long. It fires a 2,660-pound projectile with a muzzle velocity of 2,600 ft. per second; the powder charge weighs 900 pounds; the maximum range is 60,000 yards.

(5) **Gun Carriages.**—According to the use for which they are intended, gun carriages are classified as (1) field, (2) siege, and (3) seacoast. **FIELD CARRIAGES** are wheeled, and are intended to transport the guns, ammunition, and accessories from place to place, as well as to support the guns when firing. The principal parts of such carriages are the wheels, which are interchangeable for each type of carriage; the axles, stocks, brakes, elevating devices, recoil controlling devices, and the chests. **SIEGE CARRIAGES** are usually wheeled, and in addition the heaviest guns are dismounted from the firing carriage and placed upon a special carriage when changing position. But even when a special travelling carriage is not provided, the gun is shifted to travelling trunnion beds in order to distribute the weight more equally between the wheels of the limber and the gun. For the large siege guns, firing platforms of wood or concrete are necessary.

**SEACOAST CARRIAGES** include casemate, barbette or non-disappearing, and disappearing. The *Casemate Carriage* is designed for a gun which fires through a port or embrasure. It still remains in the turret mount, and as such has its best known examples in the navy. The *Barbette Carriage* is designed for a gun which fires over a parapet and remains constantly above the crest. The term is used in contradistinction to the disappearing carriage, which also fires over a parapet, but after firing drops back below the crest to load. Because of the greater angle of elevation which it permits, the barbette carriage is now used for all modern seacoast guns and mortars from the 6-inch gun to the 16-inch guns and mortars. The chief advantage of the disappearing carriage is that the gun is concealed from view and protected against direct gun fire from the front at all times, except for brief intervals.

New U. S. guns, 1941, included a 16-inch coast defense rifle and an 8-inch railway gun, said to have ranges of 30 and 20 miles respectively; a 155 mm. counter-battery gun, tractor drawn, which fires a 95 lb. explosive projectile and has a range of about 15 miles; a 105 mm. howitzer; a 37 mm. trailer-mounted anti-aircraft gun, adapted for all-around fire, total weight 5,000 lbs., can be towed by a light truck; and a 37 mm. anti-tank gun mounted on carriage.

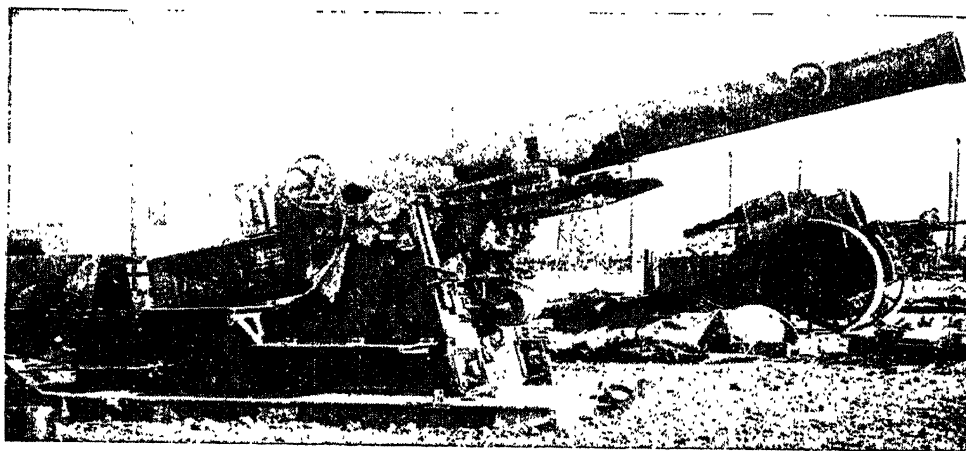
Anti-aircraft guns are considered effective for 12,000 to 15,000 feet on individual targets, and for barrages up to 20,000 or 25,000 feet. In the first years of World War II, anti-aircraft guns were very effective as a deterrent to mass bombing activities. CONSULT AMMUNITION; ARMOR PLATE; EXPLOSIVES; FORTIFICATION; GUNNERY; GUN MAKING; GUNPOWDER; RIFLE; TARGET PRACTICE; NAVAL; PROJECTILES; NAVIES; NAVY, U. S.; BATTLESHIP; CRUISER; MACHINE GUN.

See Naval Academy textbook, *Naval Ordnance* (1915); Douglas' *Machine Gun Manual* (1916); McKellar's *Machine Gun Practice and Tactics for Officers, N. C. O.'s, and*

(1905); *Paths to the City of God* (1906); *Higher Ministries of Recent English Poetry* (1907); *The Minister and the Spiritual Life* (1911).

**Gunter, Archibald Clavering** (1847-1907), English novelist and playwright, born in Liverpool, eventually settled in New York, and began to write plays, such as *Two Nights in Rome*. Among his numerous novels may be mentioned *Mr. Barnes of New York* (1887).

**Gurjun Balsam, or Wood Oil**, is obtained from *Dipterocarpus trinervis* and allied species by incision, and by the application of slow heat to the wound. It is procured in Burma and the Malacca States.



244 mm. Howitzer in Firing Position.

*Men* (1917); Clowes' *Naval Pocket Book* (London, annual); *Naval Institute* (Annapolis, bi-monthly).

**Gunsaulus, Frank Wakely** (1856-1921), American clergyman and author, was born in Chesterville, O. He was graduated from Ohio Wesleyan University in 1875 (A.M. 1887) and was ordained in the Methodist ministry in the same year. In 1879 he accepted a call to the Eastwood Congregational Church, and thereafter held pastorates at Columbus, O. (1879-81), Newtonville, Mass. (1881-5), Memorial Church, Baltimore (1885-7), and Plymouth Church, Chicago (1887-99). In 1899 he became pastor of the Central Church, Chicago. In 1893 Dr. Gunsaulus was made president of the Armour Institute of Technology. His publications include *Monk and Knight* (1889); *Transfiguration of Christ* (1892); *Life of William E. Gladstone* (1898); *The Man of Galilee* (1899); *Paths to Power*

**Gurnard**, a spiny fish belonging to the genus *Trigla* and family Cottidae. Several species inhabit the North Atlantic coasts.

**Gurney, Sir Goldsworthy** (1793-1875), English inventor, produced the oxyhydrogen blowpipe, 'Drummond' light and built a steam carriage in 1827. He also was an authority on heating and ventilation.

**Gurney, Joseph John** (1788-1847), English Quaker and philanthropist. He was supported by his sister, Elizabeth Fry, in schemes of prison reform, and was active in efforts for slave emancipation, visiting the United States and making public addresses.

**Gustavus Adolphus College**. A coeducational institution at St. Peter, Minnesota, founded in 1862. It is supported and controlled by the Swedish Lutheran Minnesota Conference of the Augustana Synod.

**Gustavus I. (Vasa)**, king of Sweden (1523-60), born at Lindholm, in Upland, in

1496. He was treacherously carried off by the Danes and imprisoned at Kalb, near Aarhus in Jutland, but escaped. He incited the peasantry of the Dales (Dalecarlia) to rise in revolt at Mora (1520). He drove out the Danes, and was proclaimed king by the Parliament of Stengås. He determined to strengthen the monarchy by putting down the wealthy hierarchy and introducing the reformation. The reformation was carried through at the Parliament of Westeras (1527). He also freed the land from the crushing privileges of the Hanseatic League. At the Parliament of Westeras (1544) the crown was made hereditary in his family. See P. B. Watson's *The Swedish Revolution under Gustavus Vasa* (1889); R. N. Bain's *Scandinavia*.

**Gustavus II. (Adolphus)** (1594-1632), king of Sweden, son of Charles IX., was born at Stockholm. His tact and wisdom gradually gained over the wealthy nobles whom his stern father had attempted to crush, and persuaded them to take the chief burdens on their own shoulders. Moreover, commerce was promoted. The war with Poland, on the other hand, dragged on for nine years, in the course of which Gustavus won (1621-99) the provinces of Livonia, Esthonia, and Courland. Peace with Poland at length left him free to turn his attention to Germany. His superior artillery enabled him to force the passage of the Lech against the imperialist general, who was killed, and the whole of Bavaria lay defenceless before him. Near Leipzig, on Nov. 16, 1632, after a severe encounter, Wallenstein was compelled to fall back upon Leipzig with the loss of several guns. Gustavus Adolphus fell in the battle. See Fletcher's *Gustavus Adolphus and the Struggle of Protestantism* (1890); J. L. Stevens's *Life and Times of Gustavus Adolphus* (1885).

**Gustavus III.** (1746-92), king of Sweden, eldest son of Adolphus Frederick. His first step after his accession to the throne in 1771 was to overthrow the oligarchical tyranny of the nobles by the bloodless *coup d'état* of Aug. 19, 1772. During the following twelve years Gustavus regenerated Sweden, reforming abuses. On the other hand, he maintained a court of extraordinary splendor, which became a burden to the people. Russia invaded Sweden, but Gustavus saved Gothenburg. The Russian war, which dragged on for two years longer, was ended by the almost complete annihilation of the Russian fleet. Meanwhile a section of the nobility formed a plot to assassinate Gustavus, and he was shot by

Anckarstrom at a masquerade at the opera-house. See R. N. Bain's *Gustavus III.* (1894).

**Gustavus IV.** (1778-1837), king of Sweden, only son of Gustavus III., became king ruling through a regent, the Duke of Sudermania, during his minority. He joined the coalition against Napoleon, against whom he conceived an almost childish hatred. Napoleon induced the Russians to invade Finland, and ultimately they conquered and annexed it (1808-9). When England advised him to make peace, Gustavus retaliated by laying an embargo on all British vessels in Swedish ports. These actions at length constrained his own subjects to depose him (May, 1809).

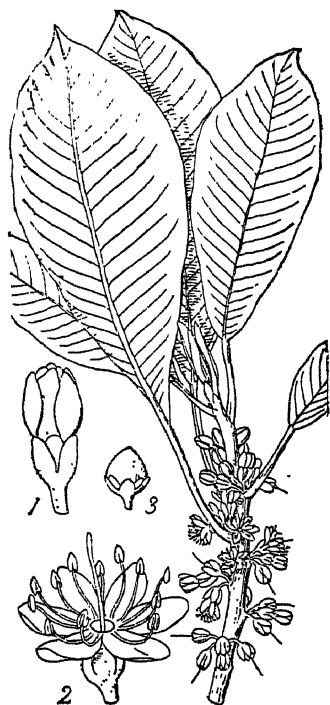
**Gustavus V.** (1858), king of Sweden. He was the eldest son of King Oscar II., and ascended to the throne Dec. 8, 1907, upon the death of his father. Gustavus married Princess Victoria, daughter of the Grand Duke of Baden and the grand-daughter of Emperor William I. of Germany. The crown prince is Gustavus Adolphus, who was born on Nov. 11, 1882.

**Gutenberg, Johann Gensfleisch, or Henne** (c. 1397-c. 1468), German printer, born at Mainz. About 1454 he elaborated the idea of printing with movable types, though it is probable he had been anticipated by one or two obscure mechanicians. It is not known that any books were printed until after he returned to Mainz (1444), and entered into partnership with a goldsmith named Faust or Fust (1450). Five years later Faust brought an action against Gutenberg, and secured possession of the work done and the press. Gutenberg continued to print. Among the best work commonly attributed to him are *The Bible of 36 Lines* (2 vols. fol., printed before 1460); *The Bible of 42 Lines* (2 vols. fol., 1450-5, known as the Gutenberg or Mazarin Bible, one of the three of which was acquired in 1930 by the Congressional Library at Washington, D. C.), and the *Catholicon* (a Latin dictionary, and the fourth book printed with a date) of 1460. Consult E. C. Pearson's *Gutenberg and the Art of Printing*; J. H. Hessels' *Gutenberg*; V. Zatzmann's *Gutenberg*.

**Guthrie**, city, Oklahoma, county seat of Logan co. Guthrie was established April 22, 1889, when Oklahoma was thrown open to the public. Within twenty-four hours, 8,000 persons were encamped upon what had been up to that time an uninhabited prairie. From 1890 to 1910 the city was the capital of Oklahoma Territory; p. 10,018.

**Gutta-percha**, a substance resembling

rubber, obtained from certain trees of the order Sapotaceæ, found chiefly in the Malay Peninsula, Borneo, Sumatra, Ceylon, and the Philippine Islands. It is a leathery solid, elastic, but lacking the flexibility and resiliency of rubber. It becomes plastic at about 65° c., and burns brightly when ignited. It is resistant to most acids and to alkalis and is insoluble in water but dissolves readily in chloroform. It is probably composed mainly of a



GUTTA-PERCHA: 1, Bud; 2, Flowers; 3, Fruit.

hydrocarbon having the formula  $C_{10}H_{16}$  and of its oxidation products. Although long known in Europe, it did not come into general use until 1842.

The best gutta percha is obtained from *Isonandra gutta*, a large tree with a trunk several feet in diameter. On exposure to the air, the milky juice coagulates, assuming a brownish color. The method of preparation is not unlike that employed for rubber.

**Guy of Warwick**, an old metrical romance, apparently of Saxon origin, but popularized by a French or Anglo-Norman writer. It was current in French in the 13th century, became popular, and was translated into English.

**Guyon, Mme., née Jeanne-Marie Bouvier de la Motte** (1648-1717), French mystic, went to Geneva to study and preach the doctrine of quietism and self-renunciation. In 1686 she took up her residence, in Paris, where Fenelon unsuccessfully supported her cause against Bossuet, who headed the ecclesiastics insisting on her condemnation. Her *Œuvres*, in 40 volumes, were published in 1790.

**Guyot, Arnold Henry** (1807-84), Swiss-American geographer and geologist, was born near Neuchâtel, Switzerland, and was associated with Agassiz in the investigation of glaciers. In 1848 he delivered at the Lowell Institute, Boston, a series of lectures later published (1853) as *Earth and Man*, and from 1855 to 1884 was professor of geology and physical geography at Princeton University. He was the author of text-books on geography, prepared *Meteorological and Physical Tables* for the Smithsonian Institution, and made a series of wall maps, besides publishing many scientific papers and works on cosmogony and physical geography.

**Guzman-Blanco, Antonio** (1829-99), president of Venezuela, was born in Caracas. Between 1870 and 1889 he was generally titular president, and always virtual dictator, of Venezuela, and during that period re-established public credit, promoted education, and opened the first railway in the country.

**Gwalior**, Maratha state in Central India. The people are mostly Hindus, engaged in agriculture. Wheat, cotton, and tobacco are the chief products; p. 3,186,075.

**Gwalior**, city, India, capital of the native state of that name; 65 m. s. of Agra. The old city, in the n., contains a huge fortress, from which an extensive view is obtained, the Man Singh Palace, and the Teleka-mandir, a Hindu temple. In the new city, known as Lashkar, is the Maharajah's palace; p. 120,000.

**Gwinnett, Button** (c. 1732-77), American patriot, was born in England. In 1770 he settled in Charleston, S. C., and afterward he was a planter on St. Catharine's Island, Ga. He was an active revolutionist; a delegate from Georgia to the Continental Congress, and one of the signers of the Declaration of Independence. He was mortally wounded in a duel with Gen. Lachlan McIntosh.

**Gwynn, Gwin, or Gwyn, Nell** (1650-87), English actress, born probably in Hereford. She grew up in poverty and, as a child, sold oranges and sang at various taverns to earn her bread. She first appeared on the stage in 1665, in Dryden's *Indian Emperor*, and her

piquant and sprightly manner gained her great popularity. Among her many lovers were Charles Hart, the Earl of Dorset, Lord Buckhurst, and after 1669 Charles II., to whom she bore two sons—Charles Beauclerk (1670), afterwards Duke of St. Albans, and James (1671), who died in his youth. She was faithful to her royal lover and became a general favorite with the people for her good humor and unflinching charity. Several plays have been based upon her career.

**Gymkhana**, the term used in India for an outdoor meet for the purpose of recreation. The word is used also for the buildings and grounds in which the sports are carried on.

**Gymnasium**, a special room or building devoted to the promotion of physical education and improvement. It is by no means a modern innovation, as gymnasia were an important adjunct of Greek education. The first gymnasium connected with an educational institution in the United States was that of the Round Hill School in Northampton, Mass., built in 1825. To-day no modern educational institution is complete without a well equipped gymnasium. The term *gymnasium* is also applied to the classical secondary schools of Germany which precede the university course, and which are distinguished by the study of classical languages.

**Gymnastics**, a system of physical exercises undertaken for the development of health, strength, and vigor, generally distinguished from athletics or field sports. Plato, writing on education (see various parts of *Leges*), devoted much consideration to the necessity of gymnastic training for the young; and about this time, Prodicus, who seems to have been the first to notice the intimate connection between the practice of gymnastics and health, designed a system of exercises, which were afterwards improved by Hippocrates (400 B.C.). The performance of manly deeds, and the various acts of knightly prowess were continued down to the end of the middle ages. From this time onwards the attention paid to athletic exercises decreased in Britain and Europe generally, and during the 17th century, and, indeed, until the end of the 18th century, fencing was the only exercise worthy of the name.

In 1762 Rousseau (in *Emile*) succeeded in arousing some interest in the subject of gymnastics; but its real revival occurred in Germany, about 1811, when F. Ludwig Jahn, called affectionately by his pupils 'Father Jahn,' established numerous *Turnplätze*, or

gymnasia, at Berlin, which became extremely popular among the youth of the country. In England, until 1858, gymnastics proper received but scant attention, boxing being the chief exercise of the upper classes in the first half of the 19th century. The advantages of gymnastic training were, however, appreciated by the British military authorities, and a beginning was made, in about 1860, toward developing the system which is now an important feature of the soldier's training. In the United States military gymnastics are also an essential part of the training of the regular army and national guard. Gymnastics also occupy an important place in the scheme of instruction in practically all American colleges, where exercise along prescribed lines is required on the part of the students. The same is true of many secondary schools, much attention being paid to the physical training of the young by systematic gymnastic exercises, under competent instructors and advisers.

Gymnastic exercises may be broadly divided into three groups (1.) free movements of the body without fixed apparatus, which are, generally speaking, adaptations of the Swedish system of Ling, and which include exercises with dumb-bells, bar-bells, and Indian clubs, as well as movements without weights or hand apparatus; (2.) pure gymnastics, with the use of heavy apparatus, such as the horizontal bar, the parallel bars, the travelling rings, the vaulting horse, the trapeze, the climbing rope, and jumping apparatus; (3.) antagonistics—boxing, fencing, single-stick, quarterstaff, and sometimes wrestling. Weight-lifting, too, is sometimes introduced into gymnastic competitions.

A system of twelve physical exercises originated by Walter Camp during the period of the Great War and known as the 'Daily Dozen' has considerable reputation as a means of keeping fit. The exercises are as follows, the first three being rather positions than actual exercises and being designed for the use of groups under a leader and not for individuals practicing the exercises alone:

1. Hands: Stand erect, arms hanging at sides, heels slightly separated, feet pointing straight ahead.
2. Hips: As before, but with hands on hips.
3. Head: Arms up, hands meeting with fingers just touching each other at back of head.
4. Grind: Arms outstretched straight from shoulders—called the 'cross' position. Turn

palms upward; make six-inch circles with hands, five times forward, five backward; keep arms stiff.

5. Grate: Arms at 'cross' position; palms down. Lift arms very slowly to angle of about forty-five degrees, inhaling; bring them down slowly to shoulder level, exhaling. Repeat ten times.

6. Grasp: Let fingers of both hands meet at back of neck. Bend neck back. Bend body forward (exhaling) very slowly from waist, keeping head up, neck bent back; eyes fixed on an object at the height of a man's eyes. Come back slowly (inhaling) to first position; then bend backward. Repeat ten times.

7. Crawl: Stand at 'cross' position. Raise right arm; let left drop at side. Then let left crawl slowly down toward the knee, at the same time curving right arm over head until fingers touch left side of neck. Return to 'cross' position and let right hand crawl and left curl over head. Five times with each hand.

8. Curl: Stand at 'cross' position. Clench fists. Begin to inhale deeply while lowering arms and bringing them slowly forward, bent at elbow; curl arms around until fists come under armpits. Bend head and shoulders backward as inhalation is completed. Loosen hands and push straight forward, beginning to exhale. Bend forward from waist, exhaling, and letting hands come back across hips; continue movement until, as you remain bent, the arms are raised behind you. Begin to inhale again as you return to 'cross' position, ready to repeat. Ten times.

9. Crouch: 'Cross' position, feet 18 inches apart. Rise on toes; keep arms out. Squat slowly down as far as you can, inhaling. Come up slowly, exhaling, and letting heels touch floor as you rise. Five times.

10. Wave: 'Cross' position. Raise arms, bending wrists until fingers touch above head. Bring both arms against head with snap movement. Moving *only from waist*, bend forward slightly, then to right, then backward, then to left, and continue until you are making a circle with your clasped hands extended above head. Repeat five times in each direction, reversing circle after first five.

11. Weave: 'Cross' position, feet apart. Raise right arm, keeping eyes on it as it goes up; bend left knee and lower left arm until fingers touch floor between feet. Back slowly to 'cross' position and reverse. Fives times for each hand.

12. Wing: 'Cross' position. Exhale, bring-

ing arms straight out before you. Continuing exhalation, swing arms down and back, bending forward slowly from waist. Continue bending forward, pushing arms back and letting breath out as movement is completed. Keep head up and eyes forward. Now inhale as you go back slowly to 'cross' position, and raise arms straight up overhead. Repeat ten times.

**Gymnema**, a genus of evergreen tropical climbing shrubs belonging to the milkweed family.

**Gymnocladus**, a genus of leguminous trees, of which there are two species, *G. chinensis*, found in China, and *G. canadensis* or *dioica*. *G. canadensis*, the Kentucky Coffeetree, occurs in Canada and in the United States from New York to Minnesota and Nebraska and as far south as Tennessee.

**Gymnospermæ**, one of the two great subdivisions of flowering plants, distinguished from the other division, the Angiospermæ, by the fact that the ovules and seeds are borne on the face of the scale, not inclosed in an ovary. The trees and shrubs bear needle-shaped, linear, or scale like leaves, usually evergreen, and monœcious or diœcious flowers. The Gymnospermæ include the Coniferæ or pine family, the Cycadaceæ or cycad family, the Gnetaceæ, or joint fir family, and the Ginkgo.

**Gynæcological Society, American**, an organization formed in 1876 for the promotion of knowledge in all matters relating to the diseases of women, obstetrics, and abdominal surgery.

**Gynæcology**, that branch of the teaching of medicine which deals with the diseases peculiar to women. It does not include obstetrics.

**Gynerium**, a genus of American tropical and subtropical grasses, with diœcious flowers, of which the Pampas grass (*G. argenteum*) is the best known species.

**Gynocardia**, the East Indian chaulmoogra tree, from which the chaulmoogra oil of medicine is derived.

**Gynophore**, in botany, a prolongation of the flower-stalk, or thalamus beyond the calyx, forming a stalk or covering for the ovary. The pink and the passion flower afford examples.

**Gyp**, pseudonym of GABRIELLE SYBILLE MARIE ANTOINETTE REQUETTE DE MIRABEAU, COMTESSE DE MARTEL DE JANVILLE (1850-1932), French novelist, born in Morbihan, castle of Kœtsal, a great grandniece of the famous Mirabeau. Her first novel, *Petit Bob*,

was published in 1882, and ran through many editions. It was followed by numerous others.

**Gypsies**, a name given to a race of wandering peoples scattered over Europe, Northern Africa, and Western Asia. The name is said to be a corruption of Egyptian, as are also the variant *Gyptien* (France and Belgium), *Gyptenaer* (the Netherlands), and *Gitano* (Spain). All these forms indicate the country whence these people were supposed to have come—Egypt, or more frequently

Their own self-applied name of *Rom*, *Roum*, or *Romano* (pl. *Romi* and *Romané*, or *Romany*) signifies 'a gypsy man'; but it is important to note that *Rom* or *Roum* was at one time equivalent to the Byzantine empire, and the wine called *Romany* received its name because it comes from Greece. This is all the more noteworthy when we find it stated that 'Little Egypt,' the alleged home of the Gypsies, was really Epirus, 'commonly called Little Egypt.' Such is the testimony afforded by two writers of the 16th century,



*Photograph from Ewing Galloway.*

*A Group of Transylvanian Gypsies.*

'Little Egypt.' This, however, was by no means their only designation. They were known besides as Bohemians and Saracens. In Poland they have been styled *Szalassi*, *Philistines*, and *Cygani*; this last word assuming also the forms *Zigani* (Russia), *Czigani* (Hungary), *Ziegeuner* (Germany), *Ciganos* (Portugal), *Tsiganes* (France), *Cingani* or *Acingani* (Corfu), *Zingari* (Italy), *Zincali* (Spain), and *Chinghiané* (Turkey). They have been frequently styled *Tartars*, notably in Scandinavia. The appellation 'Greek' appears to have been given to Gypsies in the Netherlands and also in Scotland.

quoted by Bataillard, with reference to the Gypsies who came to Strassburg in 1418. Bataillard further cites Mazaris, a Byzantine author, who, writing in the year 1416, says at that date the Peloponnesus was inhabited by 'seven principal nations,' of whom one was that of the 'Egyptians.' The French scholar also compares these statements 'with what we already know from Hopf and other sources of the existence of Gypsies in various parts of Greece in the 14th century and at the beginning of the 15th; not forgetting the deductions which Miklosich has drawn from the study of the Gypsy dialects, relative to

their long stay in that country before the 15th century'; and he finally notes 'that Gyphtoi is still at the present day one of the names given to the Gypsies in Greece, where certain ruins are known as Gyphto-Kastron' (Gypsy castles).

At this point De Goeje's statement as to the advent of Gypsies in Europe may be suitably introduced. He points out that the name Luri, given to the Persian Gypsies, is equivalent to the Arabic Zotti, or Jat; that a Persian king (Behram Gur) brought 12,000 of those people from India into his country in the 5th century; that in 855 the Byzantines made a successful invasion of Syria, and brought back 27,000 Jat prisoners, with their domesticated buffaloes and other goods; and that 'thus the first bands of Gypsies came into the Greek empire.' There is much to be said in favor of the deduction. The domesticated buffalo is still seen drawing the carts of the Roumelian Gypsies; and the Gypsies have everywhere been famous for their musical gifts, which formed the chief attraction of the 5th-century Luris or Jats in the estimation of the Persian monarch. The fact that the modern Jats of Hindustan do not speak the language of the Gypsies no doubt requires explanation; but the genealogy outlined by De Goeje seems very clear and distinct. Nevertheless, the problem of the origin of the Gypsies is still unsolved. It is evident, however, from linguistic evidence, that they are descended from some of the low caste Hindus of North-western India. There are many indications of the existence of Gypsies in Europe during the middle ages. In spite of the fact that the name 'Heathen' was used in at least one country as a synonym for 'Gypsy,' the 'Egyptians' of the middle ages are described again and again as professing the Christian faith.

All this becomes readily explicable when it is remembered that in some countries—probably in all—the local ruler of the Gypsies was not of the Gypsy race. It may thus be safely inferred that the Emperor Sigismund's letter of 1423, granted to 'our faithful Ladislas, count of the Cigani,' was not granted to an alien, but to one of his own subjects. In Corfu, as Colocci points out, there was a fief or barony of the Cigani, held by successive Venetians during the 15th, 16th, and 17th centuries. A similar instance is discernible in Scotland. On May 25, 1530, forty pounds were paid by James v. 'to the Egyptians that danced before the king in Holyrood House.' About the year 1539 he granted letters under

his great seal to 'our lovit ['beloved,' a term used in Scotch law to denote a loyal subject] John Faw, lord and earl of Little Egypt,' in which all the officers of the law throughout Scotland are commanded to assist the Gypsy leader in governing his people according to 'the laws of Egypt'; an injunction similar to that contained in Sigismund's letter to 'our faithful Ladislas, count of the Cigani,' in 1423. Although they were regarded as foreigners, yet they constituted an *imperium in imperio* in Scotland as in other countries. From other references on the Continent, it is clear that the 'Egyptians,' while closely connected with the various nations of Europe, had a government and even a country of their own. Thus, the Egyptians who visited Tournai in Hainault in 1422 'had privileges, so that none could punish them save themselves.' Duke Michael's company, when in Switzerland in 1418, are stated to have had 'a great deal of gold and silver, provided by *their own country*,' which they lavishly expended. And an English writer of 1542, Dr. Andrew Boorde, says of the Gypsies: 'Their money is brass and gold.'

But the end of the 15th century marks the beginning of the decay of 'Little Egypt,' with its peculiar privileges and power; and from that time onward, with little intermission, the European states agreed in issuing edict after edict by which the Egyptians were doomed to persecution, banishment, and death. A decree issued in 1499 by Ferdinand and Isabella of Spain forbade them to remain within that country, except under certain severe restrictions; and all previous statutes in their favor were revoked. In 1500 Maximilian I. ordained their expulsion from the whole German empire. In 1504 the Gypsies of France were ordered to leave the kingdom or go to the galleys; although the ineffectiveness of this edict may be gauged from one issued by Francis I. in 1539, wherein the Gypsies are still described as wandering about 'under cover of a simulated religion and of a certain penitence.' The term 'simulated' is significant, because in the previous century the Gypsies were actually recognized as religious pilgrims, without any 'simulation,' by popes, bishops, and princes. It seems clear that the explanation of the political position then occupied by the Gypsies must be sought in the situation previously created by the crusaders. The shadowy titles borne by the 'Egyptian' leaders, who were often of European race, are counterparts of those borne by the landless lords of Rhodes. The privileges accorded by the



various European powers would be amazing and inexplicable were it not a matter of history that these privileges had already existed for centuries, for the benefit of pilgrims wandering to and from the Holy Land. After the 15th century, the 'Egyptians' lost more and more of their political influence. Many of them traveled in bands as mercenary soldiers, hiring themselves out in the service of one country or another, while others lived by trade as horse dealers, peddlers, and tinkers; and each succeeding century shows them becoming less and less important in the eyes of Europe. In spite of frequent statements to the contrary, Romany has words for God, devil, soul, heaven, cross; but *trushul*, 'cross,' originally stood for Siva's trident. So, too, their folk lore enshrines many strange survivals of dead heathenry—of tree and serpent worship, of phallicism, tabu, and the vampire superstition. But everywhere Gypsies profess the faith of the land of their adoption—Mohammedan, Orthodox, Catholic, Protestant.

The better sort of Gypsies are quick-witted, courteous, likable, trustworthy when trusted, and lavishly generous with the one hand, though the other may itch for a bargain. Untrammelled by prejudices, and vexed by no lofty ambition, they have picked up a sort of peripatetic philosophy, so lead a pleasant, cuckoo-like existence, and make the best of this life—for a next they have small concern. As to faults, these 'spoil children of nature' are boastful, passionate, crafty, superstitious, thriftless, and indolent; they break most of the Decalogue's precepts, but lightly—great criminals are few among them.

Gypsy celebrities, outside the realm of music, have been few. John Bunyan has been claimed as one, but on slender grounds; so have Masaniello and the painter Antonio Solario (1382-1455), nicknamed 'Lo Zingaro.' Anyhow there is Jem Mace, the pugilist; and Mrs. Carlyle was proud of her Baillie ancestry.

In the United States, Gypsies are found in small bands, either in temporary settlements or traveling about the country in wagon trains. The American Gypsies are mostly of English descent, though their numbers have been augmented by accessions from the Romany of other parts of Europe, especially Germany, Hungary, and France. The real American Gypsies are for the most part comparatively prosperous, and have little occasion to resort to beggary or theft. Many of them own homes or farms, which they occupy for

a part of each year, but which they leave from time to time for the open road. In occupation they are almost exclusively dealers in horses and lately in automobiles, tinkers, and peddlers, especially of beads and baskets. The women are shrewd fortune tellers.

The Gypsy queen is almost unknown in America, except among the foreign Romany. The others have to some extent conformed to the democratic customs of the country; and while much deference is paid to the opinions of the women, the leader of the band is usually a man, who takes the title of president rather than that of king.

**Gypsophila**, a genus of hardy herbaceous plants, belonging to the order Caryophyllaceae. They bear their small flowers in graceful panicles, and like a light soil and sunny situation.

**Gypsum**, a common mineral composed of hydrous calcium sulphate ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ); specific gravity, 2.31; hardness, 1.5 to 2. It is white, colorless, or faintly tinted, ranging through brown, red, or black when impure.

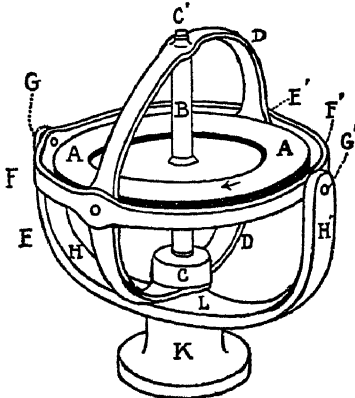
Gypsum beds are of great commercial importance, as they supply the material from which *Plaster of Paris* and like substances are made. The need for rapid construction in World Wars I and II impelled the development and increasing use of gypsum board.

**Gypsy Moth**, a small brown moth (*Portotrixa dispar*) occurring in considerable numbers in Central and Southern Europe and temperate Asia, and since 1870 in the New England States. Here it has become such a menace to forest, fruit, and shade trees that extensive and costly public measures have been adopted for its extermination. The young caterpillars soon begin to feed upon trees and shrubs of all kinds, even defoliating coniferous trees. The caterpillars reach their full size (two or three inches in length) in July, when they spin themselves flimsy cocoons, from which they emerge in about two weeks as moths.

The gypsy moth was introduced into America by Professor Trouvelot, who imported a number of living egg clusters in 1869 for research purposes. Some of his specimens escaped from his study in Medford, Mass., and by 1889 had spread through the community. Consult *Bulletins* of the U. S. Division of Entomology on the Gypsy Moth.

**Gypsy Wort** (*Lycopus*), sometimes called WATER HOREHOUND, is a perennial plant belonging to the natural order Labiatae. It is a tall, erect, branching plant, slightly hairy, with a creeping root stock.

**Gyroscope and Gyroscopic Motion.** The gyroscope is an instrument used in the study of the phenomena of bodies which rotate or spin under various conditions. There are many forms, and they are called Gyroscopes, Gyrostats, etc. In the simple gyroscope, a rotating wheel or disc is supported by its axle in a series of pivoted frames or gimbals in such a manner as to give free motion (without translation) in every direction. The apparatus designed by Lord Kelvin, and called by him the *Gyrostat*, consists of a heavy fly-wheel in a metal casing, with a flange about its periphery upon which it is free to roll. Many other forms of so-called 'gyrostats' have been devised; some are in use as toys. The term is commonly applied to partial gyroscopes in which full axial freedom is not permitted.



*Simple Gyroscope.*

Gyroscopic motion covers a wide range from a simple revolving wheel, constrained to turn about a fixed axis, to a heavenly body moving freely through space. Observations of gyroscopic motion were made by the ancients apparently without important results. The first practical application of it that is known was devised by Serson, who in 1744 made a sort of spinning top with an upper polished surface to give an artificial horizon at sea when the actual horizon was obscured by fog or mist. Among the earliest investigators of gyroscopic motion was the French scientist Foucault, and by its means he was able to show the revolution of the earth. This was effected by a very long pendulum swung in the dome of the Panthéon at Paris in 1851, its change of direction (as regards the earth) being observed by a telescope arranged for

the purpose. Just as a projected object resists a force tending to cause it to deviate from that line, so a rotating mass constrained to spin will resist a force tending to change the plane in which its center of rotary effort is contained. The simplest ordinary forms of comparatively free gyroscopic motion are seen in the pendulum, hoop, wheel, and top. The top, on account of the ease with which a high speed is obtained, is most easily studied. It brings in another factor which is not seen in a simple balanced gyroscope, and that is the preponderance or rotary effort caused by gravity tending to make it fall if the velocity of revolution is reduced below a certain speed.

In the simple gyroscope, wheel A turns upon its axis B in pivots c and c' in the ring D. This ring is pivoted at E and E' in the ring F, F', and F, F' in turn is pivoted in G and G' on the arms H and H', which are pivoted at L on top of the stand K; but this pivot is commonly locked. The steadying weight c may be removed if a perfectly balanced gyroscope is desired. The direction of rotation is shown by the arrow.

If a downward pressure be applied to the top of ring F near the pivot E, it will be resisted; but movement of the gyro will take place about the axis of E, E', the upper end of B inclining toward G. This movement, called *precession*, is thus seen to take place at right angles to the direction of the impressed force and in the direction of the rotation.

The practical applications of the gyroscope are nearly all of recent development. As a stabilizer for steadying objects which are inclined to sway, the gyroscope has a wide use.

The Sperry Company and other makers of gyroscopic machinery have been working for some time on stabilizing machinery. The most successful of the recent applications of the gyroscope is in the *Gyro Compass* (see COMPASS). All battleships in the United States Navy have been or are being fitted with these compasses. Applications of the gyroscope are also seen in airplane mechanism studies; the steadying of ships at sea; torpedoes; mono-rail trucks and trains. The *Gyro stabilizer* adopted the theory and was put to practical use as a means of increasing the steadiness of ships and airplanes. Consult Wüllner's *Lehrbuch der Experimentalphysik*; H. Crabtree's *Spinning Tops and Gyroscopic Motion* (1909).

**H**, the 8th letter in our alphabet, is derived from the Phœnician letter *cheth*, which was obtained from the Egyptian hieroglyphic symbol which goes by the name of the sieve. The Semitic name, which means a 'fence' or 'palisade,' is explained by the form of the letter, which resembles a three-barred stile. The sound was that of a strongly marked continuous guttural, produced at the back of the palate, which does not exist in English, but is heard in the Scotch *loch* and the German *lachen*. When the Phœnician alphabet was transmitted to the Greeks the name *cheth* became *ēta*. As early as the 7th century B.C. this sign had two values among the Greeks: it normally represented the long *ē*, but was permissively used for the simple aspirate *h*. In the alphabet of Italy it was used exclusively for the aspirate; hence we see how the symbol H stands for *h* in the Latin alphabet and for *ē* in the Greek.

In Old English *h* was a guttural or throat sound, but it gradually softened down to a spirant, and has now become almost a vowel. No letter is more misused, and this misuse is of ancient date. In English as early as the 12th century we find *ard* written for *hard*, and *hold* for *old*.

The quality of the sound depends partly on that of the following vowel, and its intensity to some extent on the accentuation. The aspiration is stronger in *humble* than in *humility*, in *human* than in *humane*, in *history* than in *historical*, in *hostile* than in *hostility*; but it is the same in *happy* and *happiness*, since the accent rests on the same syllable. It is stronger in *who* than in *when*, in *hole* than in *whole*. In *honor* it is very faint, in *honorable* and *honesty* it is almost inaudible. It is stronger in *host* than in *hospital*. It is retained in *harbor*, but has been lost in *arbor*. It is retained in *hair* and *hare*, but is evanescent in *heir* and *hour*, though retained in *hereditary* and *horologe*. In German musical notation the letter H is used to denote B natural, the letter B being applied to our B flat.

**Haakon**, or **Haco** (old Norse Hákon),

the name of several kings of Norway. Haakon I., the Good (915-61), son of Harold Fair-Hair, passed his youth at the court of King Athelstan of England. He ruled well, kept the nobles in check, and was converted to Christianity. Haakon IV. (1204-63), called the Old, son of Haco III., gained (1241) the overlordship of Iceland. In his old age he undertook an expedition against Scotland in defence of the Hebrides, but was defeated at Largs (1263) by Alexander III., and died in the Orkneys on his way home. Haakon VII. (1872), the son of Frederick VIII., king of Denmark, was known as Prince Charles of Denmark until in October, 1905, he was elected king of Norway. After the fall of Norway, King Haakon continued to head the Norwegian government in exile in London.

**Haarlem**, town and episcopal see of the Netherlands, chief town of the province of North Holland; 11 miles by rail w. of Amsterdam. The town is in appearance typically Dutch, with numerous canals and quaintly gabled houses. Among interesting buildings are the Church of St. Bavo (fifteenth century), and the Town Hall, originally a palace of the counts of Holland, begun in the twelfth century and remodelled in the seventeenth. It contains a picture gallery (Frans Hals) and the Teijler Museum (eighteenth century). South of the town stretch the Frederiks and Flora Parks, and the Haarlemer Wood; in the first named stands the Pavilion, containing a colonial museum (1871) and an industrial art museum (1877). Haarlem is famous for the cultivation of flower bulbs (narcissi, tulips, hyacinths, etc.). In the seventeenth century Haarlem was the center of a famous school of painting.

**Haarlem Lake**, former lake of the Netherlands, which is now drained, lay between the towns of Haarlem, Leyden, and Amsterdam, and communicated with the Zuider Zee by the River IJ in consequence of the damage done to Amsterdam and Leyden by two successive overflows of the lake in 1836, the government had it drained in 1840-53, and it now forms a commune of the province of

North Holland with a population (1910) of 19,440.

**Habakkuk** (Hebrew 'embrace'), one of the twelve minor prophets of the Old Testament. The literary style of Habakkuk is forceful, graphic, and poetical; and his teaching reveals true moral and spiritual insight.

**Habberton, John** (1842-1921), American novelist, born in Brooklyn. He served through the Civil War; was connected with Harper and Brothers (1865-72); and served on the editorial staff of *The Christian Union* (1874-7), the *New York Herald* (1876-93), *Godey's Magazine* (1893); and *Collier's Weekly* (1899). His best-known book is *Helen's Babies* (1876). Other works are: *The Jericho Road* (1877); *Other People's Children* (1879); *The Worst Boy in Town* (1880); *The Tiger and the Insect* (1902); *Budge and Toddie* (1909). He also wrote a play, *Deacon Crankett*, produced in 1880.

**Habeas Corpus** is the name of a writ which has played a very important part in the constitutional history of England, and still occupies a foremost place in the legal systems both of that country and the United States. In feudal times England was covered with private prisons, in which powerful lords detained those who had incurred their displeasure or had been convicted of some offence in a baronial court. It was part of the prerogative of the sovereign to order that any such person should be brought before his own court of King's Bench, in order that the justice of his imprisonment might be determined. Later on, what originally was the prerogative of the sovereign became the privilege of the subject, and the writ came to be issued to the keepers of royal as well as those of private prisons. The words *habeas corpus* ('that you have the body') are the most significant in the original Latin form of the writ.

The sinister ingenuity of the king's lawyers in the days of Charles I. led to many evasions of the writ and to much injustice. All these abuses were finally done away with by the great Habeas Corpus Act of 1679. In the United States, both the Federal and the State courts issue writs of habeas corpus, and many statutes have been passed dealing with the matter. The U. S. courts, however, have power to issue such a writ only where the prisoner is detained by order of the Federal Government, or has been committed for trial before a Federal court; or where the charge against him is in respect of an act done in pursuance of a Federal law or order of a

Federal court; or where his detention is alleged to be in violation of the Constitution or of a law or treaty of the United States; or where, being a foreigner, he has acted under the authority, express or implied, of his own government, so that the matter of his guilt or liability must be determined by the rules of international law.

The Supreme, circuit, and district courts of the United States may issue the writ; but since the Act of Congress of 1885, creating a right of appeal from the circuit courts to the Supreme Court in habeas corpus cases, the regular course is to apply in the first instance to the proper circuit court, and, if necessary, to appeal against its decision to the Supreme Court. The State courts may issue the writ in all cases which do not fall exclusively under the jurisdiction of the U. S. courts. In times of public danger it may be deemed necessary to suspend the law of habeas corpus. This means that a person detained in custody cannot have the legality of his detention investigated by the courts so long as the suspension remains in force. The Constitution of the United States provides that 'the privilege of the writ of habeas corpus shall not be suspended unless when, in cases of rebellion or invasion, the public safety may require it.' There has been considerable controversy as to whether the suspension requires an act of Congress, or may be effected by the President alone. In the constitutions of some States any suspension of the writ is prohibited; in others, provisions similar to those of the United States Constitution are found, definite time limits being sometimes laid down beyond which no suspension can continue.

The return to the writ consists in producing the prisoner in the presence of the court or of an authorized official, and giving a written statement of the grounds of detention. This must be done immediately or on a day appointed in the writ. Where the person to whom the order is made does not produce the prisoner named, he must state the cause of his failure to do so—that the prisoner is not in his custody, or is seriously ill. The case is heard by the court without a jury, and evidence usually of a more or less informal nature may be required. If no good ground is made out for detaining the prisoner in jail, he is either discharged absolutely, or liberated on bail, as circumstances may require; otherwise he is recommitted to jail as before. If the person to whom the writ applies is detained by private individuals—a

madman in the custody of his friends—the whole facts of the case must be stated in the return and established to the satisfaction of the court.

**Habit.** Ordinarily the term is applied to those actions of the individual that, beginning voluntarily or spontaneously or under excitement, are continued until they persist of themselves, thus being secondary, automatic actions. Habits tend to become periodic, as the return of appetite at stated intervals, and the waking at a fixed hour. Habitual actions may proceed in full consciousness, yet be entirely beyond modification by consciousness. Psychologically, habit means that mental functions once established become easier with repetition, are accompanied by feelings of familiarity, and gradually cease to be accompanied by any feeling of effort.

**Hackensack,** village, county seat of Bergen co., N. J., on the Hackensack River. The Dutch Reformed Church was erected in the seventeenth century. The principal industries are iron foundries, carriage works, silk factories, and wallpaper manufactories. At Hackensack there is a monument to Gen. Enoch Poor, who died here during the Revolutionary War. It was settled in 1668; p. 26,279.

**Hackett, James Henry** (1800-71), American actor, was born in New York City. He was a clever comedian, and his impersonations of Yankee and Western characters were very popular. Some of his best-known characters were Justice Woodcock, Sylvester Daggerwood, Dromio, Rip Van Winkle, and Falstaff. He appeared for several seasons in London.

**Hackett, James Keteltas** (1869-1926), American actor and theatrical manager, was born in Wolf Island, Ont. He was graduated from the College of the City of New York (1891), and studied at the New York Law School. He made his *début* in 1892, with A. M. Palmer's Company. His best-known parts were in *The Prisoner of Zenda* (1896 and 1908), *Rupert of Hentzau* (1898), *The Pride of Jennico* (1900), *Don Caesar's Return* (1901), *The Walls of Jericho* (1905), and *The Grain of Dust* (1911).

**Hackettstown,** town, Warren co., New Jersey, on the Musconetcong River. It has manufactures of flour, silk, and hats, and iron foundries. The town was settled before the Revolution; p. 3,289. Schooley's Mountain, a well-known summer resort, lies 3 miles to the s.

**Haddock** (*Gadus aeglefinus*), a fish of the

same genus as the cod, and much resembling it in general appearance. The haddock is brown on the back, silvery on the belly; the lateral line is black, and there is a black spot behind each of the pectorals, these spots sometimes extending so as to meet on the back. An ancient legend ascribes these spots to the finger and thumb of St. Peter, and states the haddock to be the fish from the mouth of which he took the tribute money, the inventors of the legend overlooking the improbability of a marine fish living in the fresh-water lake of Gennesaret. The distribution of the haddock is from the Arctic seas to about the Bay of Biscay on the European coast, and to Cape Hatteras on the American side. While large quantities are consumed fresh, it is also smoked on a large scale, especially in Europe as 'finnan haddie,' named from Finnan or Findon, in Kincardineshire, Scotland.

**Haddonfield,** borough, Camden co., New Jersey. It has manufactures of knit goods, dairy apparatus, stoves, and pottery. The Colonial or American House, where the first legislature met, is still standing; Colonel Cooper's mansion and the Elizabeth Haddon House are of historic interest; p. 9,742.

**Haddon Hall,** old English baronial mansion, dating from the fifteenth and sixteenth centuries, on the right bank of the Wye. It has been successively the seat of the Peverils, Avenells, Vernons, and the dukes of Rutland. A fine avenue of lime and sycamore trees still bears the name of 'Dorothy Vernon's Walk.'

**Hades,** in Greek mythology, the god of the lower world; also called Pluto, Dis, Orcus, and Tartarus. In later writers his name is often used to denote the lower world.

**Hading, Jane** (1859-1941), the stage name of Jeanne Alfredine Trefouret, a French actress, born in Marseilles. Under the directorship of Koning, whom she married and soon divorced, she became one of the most famous comedienues of her day. She accompanied Coquelin to the United States in 1888 and 1894.

**Hadith,** the Arabic name for the compilation of the teachings of Mohammed which, with the Koran, form the supreme authority for Mohammedan religion and law; it is also known as the Sunna.

**Hadj, or Haj,** an Arabic word denoting the pilgrimage to Mecca. If possible every pious Mohammedan performs this pilgrimage to the 'black stone' of the Kaaba at Mecca once in his life. A somewhat similar pil-

grimage to Jerusalem, undertaken by members of the Greek and Armenian Churches, confers the same title.

**Hadley, Arthur Twining** (1856-1930), American educator, was born in New Haven, Conn. He was graduated from Yale in 1876 and became lecturer there on railroad transportation in 1883-86. He was professor of political science in 1886-98, and was president of the university (1899-1921). In 1907-8 he was Roosevelt professor in Berlin and in 1914 was lecturer at Oxford, England. His publications include *The Education of the American Citizen* (1901), *Freedom and Responsibility* (1903), *Standards of Public Morality* (1907), *Some Influences in Modern Philosophic Thought* (1913), *Economic Problems of Democracy* (1923), *The Conflict between Liberty and Equality* (1925).

**Hadley, Henry Kimball** (1871-1937), American composer. In 1895 he was appointed instructor in music in St. Paul's School, Garden City, L. I. After touring Europe in 1908, he was conductor of the Seattle Symphony Orchestra, conductor of the San Francisco Orchestra, associate conductor of the New York Philharmonic Orchestra, and had been conductor of the Manhattan Symphony Orchestra since 1929. He composed a concert overture, symphonies, ballads, trios, chamber music, comic operas and numerous songs and piano pieces.

**Hadley, Herbert Spencer** (1872-1927), American lawyer and public official, was born in Olathe, Kansas, and began the practice of law in 1894 at Kansas City, Mo. In 1904 he was elected attorney-general of Missouri. A political opponent of Governor Folk, he cooperated with him in his enforcement of the State laws against combination in restraint of trade, and in 1906 secured evidence from officers of the Standard Oil Company in regard to its ownership of alleged rival companies doing business in contravention of the State anti-trust law. In 1908-13 he was governor of Missouri, in 1917-23 was professor of law at the University of Colorado, and in 1923-7 was chancellor of Washington University, St. Louis. His published works include *What the Railroads Owe the People*; *Rome and the World Today*.

**Hadley, James** (1821-72), American philologist, was born in Fairfield, N. Y. He was graduated from Yale in 1842 and was assistant professor (1848 to 1851) and professor of Greek there from 1851 until his death. He was known particularly as a linguist and philologist. He is the author of a *Greek*

*Grammar* (1860); *Elements of the Greek Language* (1869); *Philological and Critical Essays* (1873).

**Hadrian's Villa**, a county seat of the Emperor Hadrian near Tivoli (*Tibur*), about 17 miles northeast of Rome. There were fine gardens, a palace, temples, a stadium, Greek and Latin theatres adorned by statues, and other works of art, but it is now a heap of ruins.

**Hadrianus, Publius Ælius** (76-138), styled Hadrian, emperor of Rome (A.D. 117-138), was born in Spain. He accompanied Trajan in his wars and was Legate of Syria commanding the armies of the East when Trajan died. The army acclaimed him and the Senate confirmed his accession, in spite of doubts as to his legal rights. Hadrian gave up three eastern provinces, pacified the wild border tribes and devoted himself to urbanizing the provinces, and stimulating culture and the arts. While suppressing revolts, he waged no wars of aggression. He spent much of his time in travel, surveying and studying the empire's needs. His progress was marked by new cities, aqueducts, temples, libraries, theatres and roads. A lover of Greek culture, he rebuilt Athens. His most famous buildings are the Pantheon and his mausoleum. Consult W. D. Gray, *A Political Ideal of Emperor Hadrian*, etc.

**Haeckel, Ernst Heinrich** (1834-1919), German biologist, famous for his detailed zoological researches, for his great generalizations on biological topics, and for his powers of popular exposition. His zoological researches were confined chiefly to the Invertebrata. His works are beautifully illustrated, the author being renowned for his ability as a draughtsman. Of general biological interest is his work on animal morphology, which contains in germ much that has been subsequently put forward by others. Haeckel was the first naturalist who drew up genealogical trees to show the descent of animals. His 'gastræa theory,' based upon his 'fundamental biogenetic law,' that the ontogeny or development of the individual is a recapitulation of the phylogeny or development of the race, still lies at the base of all modern zoological classifications. Haeckel's more popular works include *History of Creation* (4th Eng. ed. 1892), *The Evolution of Man* (new ed. 1905), and *The Last Link* (1899). What may be regarded as the summary of his speculative views as to man's position in the universe is contained in his *The Riddle of the Universe* (1900).

**Hæmatocele**, any effusion of blood into a hydrocele, or other cavity, most commonly used for such effusions into the *tunica vaginalis* or serous covering of the testicle. It is commonly the result of trauma, though it may occur as a complication of malignancy and in certain blood diseases, as hæmophilia and scurvy. It is distinguished from a hydrocele, which contains lymph, by not being translucent, and generally by being firmer and heavier.

**Hæmatoxylin** ( $C_{16}H_{11}O_6$ ), the coloring principle extracted from logwood. It forms yellow crystals that are slightly soluble in cold water. It is much used in microscopy as a nuclear stain, in conjunction with eosin or other cytoplasmic stain.

**Hæmatozoa**, a general term of no zoölogical significance sometimes applied to various organisms found in the blood of man or animals.

**Hæmaturia**, the condition in which blood is passed with the urine. It may be due to any of a variety of diseases, to parasites in the blood, or to overdoses of certain drugs.

**Hæmodoracæ**, an order of perennial herbs, mostly natives of sub-tropical countries. They derive their name from the blood-red liquid obtained from the roots of many species.

**Hæmoglobin**, the chief component of the red corpuscles of the blood, to which blood owes its color and power of carrying oxygen. Hæmoglobin readily unites with the oxygen of the air to form the bright scarlet oxy-hæmoglobin, which gives up its oxygen again to oxidize the dissolved food with which it is brought into contact in the tissues.

**Hæmophilia**, an hereditary disease in which the coagulation or clotting time of the blood is markedly prolonged, with the result that there is a notable tendency to hæmorrhage following even the most trivial injury, such as an abrasion or a bruise.

**Hæmoptysis**, the spitting of blood which comes from the lungs, as distinguished from hæmatemesis, in which the blood comes from the stomach. Hæmoptysis arises from the rupture of an artery in the lung tissue, and the blood is usually bright in color.

**Hæmorrhage**, the discharge of blood from the vessels which normally contain it. Three varieties of bleeding are described—arterial, venous, and capillary. In arterial hæmorrhage the blood is bright red in color, and is ejected in spurts which correspond to the cardiac contractions. Venous blood is dark purple, and flows without pulsation; while in capil-

lary hæmorrhage there is a general oozing from the damaged vessels.

**Hæmorrhoids**. See **Piles**.

**Háfiz** (d. 1388), the greatest of Persian lyrical poets, his real name being Mohammed Shams ed-Din. All that is certain of his life is that he lived in Shiraz in retirement and literary ease, died and was buried there. His chief work is a collection (*Diwan*) of short odes, or *ghazals*, arranged in couplets and following each other in alphabetical order. They celebrate wine and women, and are of a fervidly sensuous nature.

**Hag**, or **Hag-Fish**, one of the cyclostomata or round mouths, allied to the lamprey. It is common off the coasts of the North Atlantic generally, living in muddy ground at a depth of 40 to 345 fathoms. The mouth is a hallow suctorial disc, furnished with a single tooth above and two rows of strong, pointed, horny teeth below. The body is eel-shaped, with no lateral fins, but a slight median fin round the tail. There are no bones; the backbone is represented by a persistent notochord with a cartilaginous sheath; the skull and mouth-skeleton are also cartilaginous. There are no genital ducts. In the young state the animals are hermaphrodite, and contain immature eggs and ripe milt; when older they produce eggs only. The fish is about 15 inches in length when adult, and of a livid red color. When not feeding the fish lies buried in the mud, with only the single nostril protruded.

**Hagar** (Heb. 'flight'; cf. *Hejira*), the handmaiden of Sarah and mother of Abraham's eldest son, Ishmael, was of Egyptian origin. Her flight, as recorded in Genesis, and her expulsion present interesting points of comparison. She was regarded as the ancestress of the Hagarenes or Hagarites.

**Hagen**, town, Prussia. It is a growing industrial center, with iron works, cotton and cloth mills, tanneries, breweries, distilleries, and manufactures of cigars and tobacco, and paper. There is a royal school of engineering; p. 101,000.

**Hagen, Friedrich Heinrich von der** (1780-1856), German scholar. His great achievement was to revive interest in the old German poetry. His editions of the *Nibelungenlied* (1810), the *Heldenbuch* (1855), the poems of Gottfried von Strassburg (1823), a collection of *Minnesinger* (5 vols. 1838-56), and *Altnordische Lieder und Sagen* (1814), though now mostly superseded, were epochal.

**Hagen, Walter** (1892- ), American

professional golfer unequaled for his continued prowess in tournament play. He was the first American to win the British open championship (1922), winning it again in 1924, 1928, and 1929. He won numerous other golf titles and did much to popularize the game in America. Another of his victories was the 1931 championship of the Canadian Open Tournament.

**Hagenbeck, Karl** (1844-1913). German-American showman and animal trainer. His father had formed a collection of wild animals, and when Karl was fifteen he was given control of the business. He soon had travelers in every part of the world, and he himself visited England, America, and various European countries, and established relations with the directors of zoological gardens and wealthy private naturalists. In 1902 he acquired a large tract of land at Stellingen, near Hamburg, and there established his famous Animal Park, where the animals lived, as near as possible, a natural life, being allowed to roam freely over restricted areas. For a number of years Hagenbeck exhibited trained and wild animals in various countries, especially in the United States.

**Hagerstown**, city, Maryland. The chief public institutions are the Washington County Hospital, Washington County Free Library, the County and City Orphans Home, and the Bellevue Asylum. Industrial establishments include machine shops, flour mills, and factories; P. 32,491.

**Haggai**, a prophet of Israel who lived in the early years of the restoration from the Captivity. Haggai prophesied that the dearth then upon the land was due to the Divine displeasure with the settlers for adorning their own houses while the house of God remained unfinished.

**Haggard, Sir (Henry) Rider** (1856-1925), English novelist. He served on commissions in Africa and the United States. As a novelist, he made good use of his South African experiences in many thrilling stories. These include: *King Solomon's Mines* (1886); *Cleopatra* (1889); *Alan's Wife* (1889); *Montezuma's Daughter* (1894); *Black Heart and White Heart* (1900); *The Way of the Spirit* (1906); *Benita* (1906); *Queen Sheba's Ring* (1910); *Child of Storm* (1913); *Love Eternal* (1918); *When the World Shook* (1919); *Wisdom's Daughter* (1923). He wrote also: *A Farmer's Year* (1899); *Rural Denmark and Its Lessons* (1911).

**Hague, Frank** (1876- ), mayor of Jersey City, N. J., home of his birth. In 1913

when the commission form of government was established in Jersey City, he was elected member of first Board of Commissioners. Elected mayor, 1917, he has served continuously since then, present term expiring 1943. Hague's refusal to allow public meetings by C.I.O. and like agitators, was enjoined by Federal court, 1938, for contravening the Constitution; and injunction sustained, 1939, by U. S. Supreme Court.

**Hague, The** (DUTCH, 's *Gravenhage* or *Den Haag*), capital of the Netherlands, is situated in the province of South Holland. It is one of the handsomest cities in the country, being intersected by canals and shady avenues of lime trees, and having many fine structures. In the center of the city is the artificial lake known as the Vijver, around which are grouped many noteworthy public buildings. To the s. is the old Castle of the counts of Holland, consisting of an outer and an inner court; in the latter are the thirteenth-century Gothic knights' hall and the chambers in which the Dutch Parliament holds its sittings. On one side of the outer court stands the Gate Tower, which was formerly used as a state prison. Noteworthy institutions are the Picture Gallery, the most precious possession of the city; the Municipal Museum, containing a good collection of Dutch pictures; and the Ethnographic Museum, rich in Chinese and Japanese articles. North of the Vijver are the Royal Palace, the Royal Library, and in the center of the large square 'Plein 1813' the national monument commemorating the recovery of Dutch independence. West of the Vijver stands the 'Great Church' of St. James, a Gothic structure of the fourteenth century, and the picturesque Town Hall.

The beautiful *Palace of Peace*, located on Scheveningen Avenue, and completed and dedicated in August, 1913, is now the permanent seat of the International Court of Arbitration, established in 1901. Andrew Carnegie contributed \$1,500,000 toward the cost of the building. The center of the building is occupied by a courtyard 14 ft. long and 11 ft. wide, with a fountain in the center where the air to be breathed in the building is washed before being filtered and otherwise dealt with by the ventilating apparatus. The whole building is, roughly, 260 ft. square. Close to the town is the beautiful pleasure park called 'The Wood,' in which stands a royal residence (1647) with the magnificent so-called 'Orange Hall.' The principal industries of The Hague are iron founding, copper



and lead smelting, cannon founding, printing, furniture and carriage making, and the manufacture of gold and silver lace and decorations; p. 495,000.

**Hague Peace Conference.** The First Peace Conference had its origin in the desire of Nicholas II., Emperor of Russia, to initiate measures looking toward 'the maintenance of the general peace, and a possible reduction of the excessive armaments which were burdening all nations.' His suggestion was taken up by the various governments, and on May 20, 1899, delegates from twenty-six states met at The Hague in response to the invitation of the government of the Netherlands. The First Conference failed to achieve any limitation of armaments, but addressed itself, with some degree of success, to the other questions brought before it. The work of the Conference was set forth in the Final Act, signed July 29, 1899, by the delegates of all the states participating. This Final Act specified, as the actual results of the Conference, three conventions and three declarations, each of which was to be a matter for separate ratification. The first convention provided for the pacific settlement of international disputes; the second convention was a formulation of the laws and customs of war on land 'with the view of defining them more precisely, or of laying down certain limits for the purpose of modifying their severity, as far as possible'; the third convention adapted to maritime warfare the principles of the Geneva Convention of 1864.

The declarations were attempts to mitigate modern warfare by prohibiting: the discharge of projectiles and explosives from balloons, or by other similar new methods; the use of projectiles the only object of which is the diffusion of asphyxiating or deleterious gases; and the use of bullets which expand or flatten easily in the human body. In addition, the First Conference adopted a resolution calling for the restriction of military budgets, and gave expression to six wishes on various subjects upon which international action was considered desirable.

The Second Peace Conference met in the summer of 1907, and was attended by the representatives of forty-four states. The constructive work of the Second Conference is the convention relative to the International Prize Court. It was to lay down the generally recognized principles of international law for such a court that the Naval Conference met at London in 1908. The Conference of

1907, like its predecessor, gave expression to certain wishes, among them the wish that the laws and customs of naval warfare be formulated in a convention similar to that for war on land. The World War intervened to prevent a meeting of the Third Peace Conference. At the close of the war, the League of Nations was established, in connection with the treaties, for the purpose of intervention in threatened wars to preserve peace. The Council of the League of Nations, through a committee, planned a Permanent Court of International Justice, usually called the World Court, which was first held at the Peace Palace in January, 1922. This Court has functioned, in settling certain international disputes, since that date. See PEACE. Consult Higgins' *The Hague Peace Conferences*.

**Hahnemann, Samuel Christian Friedrich** (1755-1843), the founder of the homœopathic method of treatment. His observation and practice had so fully convinced him of the injurious character of the prevailing methods of treatment, that he abandoned all practice and devoted himself to chemical research. His conclusions were published in an essay in *Hufeland's Journal* in 1796, under the title 'A New Principle for Ascertaining the Curative Properties of Drugs.' In this essay the principle or rule of *similia similibus curantur* is first put forward by him. His views at once met with vehement opposition, and he retired to Köthen, where he became a center of attraction to invalids from all parts of the world. Hahnemann's book *The Friend of Health* proves him to have been far in advance of his time in the field of preventive medicine. See HOMŒOPATHY.

**Haidarabad, or Hyderabad,** the dominions of the nizâm, situated in the Decan, India. Area, 82,700 sq. miles. The principal rivers are the Godavari and the Kistna (Krishna). The soil is in general very fertile, but poorly cultivated. The products are rice, wheat, maize, mustard, castor oil, sugar cane, cotton, indigo, fruits. The pasturages are extensive, and sheep and horned cattle are numerous. Hides are exported, and the industries produce embroidery and metal ware. The country came under the contending influences of France and Great Britain in 1748. In 1861 the Haibarabad Assigned Districts were transferred to Britain in exchange for certain other districts. The nizâm is the premier native chief of India; p. 13,374,676.

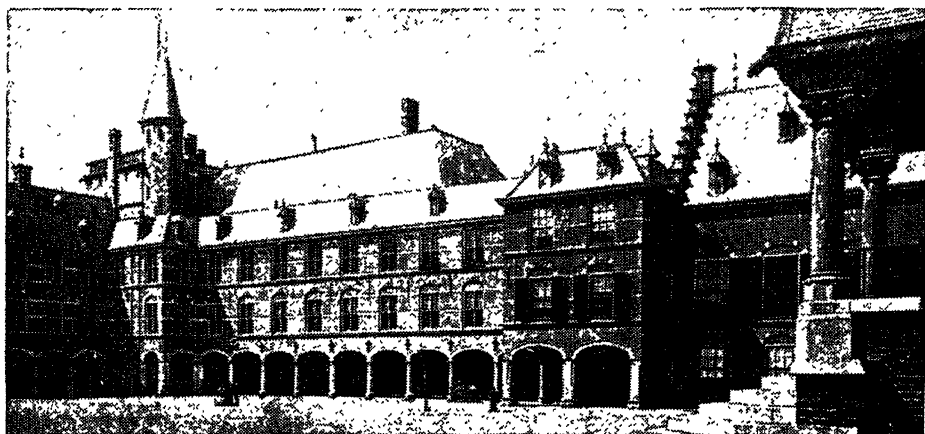
**Haidarabad,** capital of the above state, one of the largest cities in India. Founded in

1589, it is one of the most striking of Oriental cities. It is 6 miles in circumference, and is surrounded by a stone wall, flanked by bastions. Its chief features are the Palace of the nizam, the College (Chár Minár), a mosque accommodating 10,000 persons, and the British Residency. Its market for Decan-bred ponies attracts dealers from all parts of Asia; p. 500,623.

**Haidarabad**, chief town in district of same name, Sindh, Bombay Presidency, India. The district—area, 9,030 sq. miles; p. 1,000,000—is an extensive alluvial plain. The town, lying near the delta of the Indus, is defended by a fortress, and has a large arsenal. It is noted for fine gold and silver embroideries and lacquer ware; p. 70,000.

Army on the French-Flanders line. In 1916 he succeeded French as commander-in-chief of the entire English forces in France, and thereafter was one of the outstanding figures in the war. He devoted the last years of his life to the interests of former soldiers throughout the Empire and was the originator of 'Poppy Day.' He received the thanks of Parliament and was voted the sum of £100,000. He is the author of *Cavalry Studies* (1907).

**Hail**, compact masses of ice and snow, usually arranged in concentric layers round a central nucleus of clear ice. The formation of hail takes place in clouds which are commonly at a great height, between 15,000 and 40,000 ft. Conditions associated with the



*The Hague: Palace of Peace.*

**Haiduks, Hayduks, or Hajduks** (Hungarian 'drovers'), originally outlaws in the sixteenth century who, refusing to submit to Turkish rule, were regarded by the populace as patriots, and found refuge in the mountains of Eastern Hungary. The name was also given to bands of semi-brigands among the Bulgarians and Servians; to the retainers of Hungarian magnates, to the minor officers of justice and to outriders of the rich in France.

**Haig, Sir Douglas**, First Earl (1861-1928), British general, son of a Scotch gentleman. He participated in Kitchener's Sudan campaign; and the Boer War. He became lieutenant colonel of Lancers, inspector general of cavalry in India, and major general. In England, he was successively director of military training and director of staff duties at army headquarters. When the World War opened he was made commander of the First

production of these clouds are the expansion and congelation of warm, moist air in a state of cyclonic whirl, combined with a sudden commingling of masses of air differing greatly in temperature and vapor tension. Although associated with thunderstorms, there is no proof that electricity is the primary agent in the production of hail. Large hail is usually preceded by an unusual degree of heat, and is chiefly met with in hot, dry climates, and in the hottest part of the day.

**Hail Mary.** See *Ave Maria*.

**Hainan**, island off the coast of Kwangtung prov., China, about 150 miles long and 100 broad. The coasts are flat; the mountains of the interior are densely wooded. The staple products are sugar, betel nuts, hides, mats, pigs, cattle, and fruits. Tin, gold, silver, copper, and lead are found. Kiung-chow, the capital, p. 70,000, is 3 miles from its port,

Hoi-how. The island is subject to frequent earthquakes, and in summer to typhoons; p. 2,000,000.

**Hainault, Hainaut, or Hennegau**, southern prov. of Belgium, lying alongside the French depart. of Nord. It is generally level, but broken by spurs of the Ardennes. The principal rivers are the Haine, Scheldt, Dender, and Sambre. Wheat, flax, fruit, and vegetables are produced. Excellent breeds of horses, horned cattle, and sheep are reared. Iron and coal are mined, and marble, build-

prov. of Haiphong, French Indo-China. The chief industries are rice growing, cotton spinning, cement making, and fishing. The town is a commercial port and a French naval station, with government and private shipbuilding yards; p. of prov., 70,000; of town, 20,000 (1,000 Europeans).

**Hair**, the characteristic covering of mammals, never completely absent in normal mammals. Its primary function is to maintain the body temperature by diminishing the loss of heat; but in many mammals certain hairs



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HAITI: Going to Market.

ing stone, and limestone quarried. Linen, porcelain, iron and steel products, lace, paper, and leather are manufactured; p. 1,220,271, principally Walloons. The capital is Mons; p. 20,085. From the ninth to the seventeenth century Hainault formed an independent countship, but from 1678 it was divided between France and the dynastic rulers of Spain and Austria. It is the latter section which forms the present Belgian province.

**Haiphong, or Haifong**, capital of the

act also as sense organs, constituting the *vibrissæ*, or whiskers. Histologically, hairs are outgrowths of the epidermis, and develop in little pits known as the *hair follicles*. These lie in the corium or true skin, or may even penetrate into the subcutaneous tissue. The corium rises up at the base of the follicle as a vascular papilla; this is the important structure as regards the growth of the hair, and in fixing it in position, for the hollow base of the root fits over this projecting papilla like

a cap. Each hair follicle has attached to it a little bundle of muscular fibres, by means of which the hair may be erected. These muscles are of the non-striated type, and cannot be made to contract voluntarily; but they do so under the influence of certain emotions as fear, or in exposure to cold.

The coloring of the hair is due primarily to the nature and amount of the pigment present in the fibrous layer. The duration of hair life is limited, and sooner or later it is shed. As age advances the hair becomes gray. This is a natural and physiological process; but it may be hastened by severe trouble or other causes. In many cases the premature blanching of the hair appears to be hereditary. The hair is regarded by anthropologists as of high importance as a race character. Although there is no one special color of hair peculiar to any one race, there are characters present in the hair which separate many of the races of man widely from one another. In the American Indians, Chinese, Japanese, and natives of various other parts of Asia the hair is long, straight, and harsh like a horse's mane. Among the negroes, Hottentots, and Papuans it is crisp and woolly. Between these extremes we may place the European, in whom the hair is wavy and flowing.

**Hair Dressing.** Among savages the most extraordinary diversity as to the dressing of their hair obtains; some frizzing it to the utmost extent, some fixing it in all sorts of perverse arrangements by means of frames, and some partially shaving the head. The Chinese pigtail, the American Indian scalp lock, and the Moslem shaven head, with a small tuft left by which to be ultimately lifted into Paradise, are all well known. Among modern civilized Europeans the courtiers and cavaliers of the seventeenth century adopted the practice of wearing those 'love locks' which excited the ire of the Puritans. It was, however, in the management of ladies' hair that the art of the professional hair dresser was in those times mainly exercised. In the eighteenth century, through the influence of French fashions, the dressing of hair, male and female, rose to a great pitch of extravagance and folly. The hair of a lady of fashion was frizzed up in convolutions and curls, decorated with ribbons, jewels, and feathers, and filled with pomatum and powder. After the fall of the French monarchy, comparative simplicity reigned. The enormous chignon of 1870 gave way to equally enormous plaits; since then comparatively simple fashions have prevailed. As regards ladies' hair, fashion is

constantly altering. With respect to men's hair, short cutting is now universal, with the predominance of the clean-shaven face, or at most the closely cropped moustache. See **Wig**.

**Hair Grass** is a genus of perennial grasses of agricultural value. They are characterized by a lax panicle, the spikelets being laterally compressed, with two perfect florets.

**Hair Industries.** The hair of animals is often used in combination with wool and other fibres. *Horse Hair*, however, has a distinct place, and is largely used in upholstery. Hair from a dead animal is of very inferior quality. After cleansing, the hair is combed and arranged into different lengths and sizes, and is often dyed. It is then used in the production of different qualities of toilet and other brushes, fishing lines, and fancy articles. Its most important use is in the making of haircloth. Short hair is curled for the stuffing of chairs and sofas. *Cow Hair* is utilized in considerable quantities by plasterers to bind the plaster put on the inside walls of houses. It is also used in the manufacture of roofing and other felts. *Camel Hair* is woven into a soft, warm, and durable cloth for personal wear; it is also made into carpets, tent coverings, and other articles.

**Hairs of Plants** are outgrowths of epidermal cells, which assume various forms. A plant may have only one form of hair; but most plants have several forms. Similar kinds of hairs are often characteristic of plants belonging to the same order, such as the glandular hairs of the sundew order, the stinging hairs of the nettle order, and the scaly hairs of ferns. Root hairs absorb water and certain minerals essential for the life of the plant. The aerial organs of plants develop hairs which serve to protect them from cold, or injury from other sources.

**Hair Tail**, a genus of acanthopterous fishes belonging to the tropical marine fauna. The body is long, scaleless, compressed and ribbon shaped, terminating in a long, whip-like tail. Some attain a length of four ft. The Silvery Hair Tail is found in the Atlantic from Cape Cod to Florida and the West Indies.

**Hair Worm.** See **Gordius**.

**Haiti, Hayti, Santo Domingo**, or **Hispaniola**, the second island in area and population in the West Indies. Length, about 400 miles; breadth, 24 to 165 miles; total area, 28,249 sq. miles. The surface rises in densely wooded mountains, with fertile valleys. The axis of the mountain system is the Cibao range. The highest point is Loma Tina (10,-

300 ft.), near Santo Domingo. Among the rivers are the Artibonite, navigable for 100 miles; the Yaqui del Nord; the Yuna; and the San Juan. The climate is healthful, except in the lowlands, and on the heights is reasonably cool. The rainy season lasts from May to October, or somewhat later. The coast is lofty, indented by many good harbors. Politically, the island of Haiti is divided into the Republic of Santo Domingo and the Republic of Haiti.

The Republic of Haiti comprises the western third of the island. Despite primitive methods of agriculture, the fertile soil yields excellent crops of coffee, sugar, tobacco, cacao, and cotton. Logwood, mahogany, and lignum vitae are cut for export, especially to the United States. Mines are little worked. Imports are mainly cotton goods, provisions, iron manufactures, machinery, and kerosene, mostly from the United States. The population of Haiti is estimated at 2,555,000, about 90 per cent. of whom are negroes, the remainder being chiefly mulattoes. There are about 3,000 foreigners and some of these are Caucasians. The largest city is Port-au-Prince, the capital; p. 80,000. The state religion is Roman Catholicism, but religious freedom is guaranteed by the constitution. The clergy are French, as also is the official *patois* language. Primary education is free and compulsory since 1910, but is still backward in rural districts. The Constitution, effective June, 1935, provides for a Chamber of 37 Deputies elected for a four-year term and a Senate of 21 members elected for a six-year term. The President holds office for five years. The unit of currency is the *gourde*, with a value of 20 cents.

Haiti was discovered by Columbus on Dec. 6, 1492; and in little more than a generation the aborigines were swept away by the Spaniards, who as early as 1505 introduced negro slaves to fill their places. Next came the Buccaneers, chiefly French. The western portion of Haiti was in 1697 ceded to France by the Peace of Ryswick. Napoleon's attempt to re-enslave the negroes, who had been freed in 1794, resulted in a series of massacres, and ended in the expulsion of the French and British by Toussaint l'Ouverture in 1798. In 1804 Dessalines proclaimed himself emperor of Haiti; in 1811 Christophe was proclaimed king; and in 1844 the eastern negroes separated from Haiti, and formed the Republic of Santo Domingo. The history of Haiti is marked by frequent revolutions. In November, 1915, the United States established a

virtual protectorate over Haiti by a treaty ratified by the Haitian National assembly, and forced improved sanitation, built roads, installed sewerage plants, and built hospitals.

American control of Haiti involved a delicate situation, arousing suspicion in the island, among the Latin Republics, and even protest in political circles at Washington. In February, 1930, President Hoover appointed a commission to investigate the problem. Unrest and disorders continued, and in 1931 an insistent clamor arose in Haiti for immediate evacuation by United States officials and troops. In 1934, U. S. control was withdrawn from the country.

Great numbers of Haiti's overpopulation seeking employment in Santo Domingo, were forcibly and cruelly ejected by that country in 1937 and some 10,000 of them killed; declared war on Ger., It., and Jap., 1942. Consult Davis' *Black Democracy* (1929).

**Hakata**, seaport, Japan, opened to foreign trade in 1899. It stands opposite Fukuoka, of which it forms a part, and is noted for silk fabrics.

**Hake**, a genus of fishes closely related to the cod family, having a flattened head, and elongated body, covered with bright scales, two dorsal fins, of which the first is short and the second very long, one long anal fin, and the mouth destitute of barbels. The hake is sometimes 3 or 4 ft. in length, weighs about 5 pounds, and is of a whitish color, grayish on the back. The species abound in all temperate and moderately cold waters. It is voracious, devouring great numbers of herrings and pilchards; hence it is frequently called the Herring Hake.

**Hakluyt (Hackluyt), Richard** (c. 1552-1616), English geographer. He was interested in the history of discovery and was the first to introduce maps, globes, spheres, etc. in common schools. In 1582 he published his *Divers Voyages Touching the Discovery of America*. Other geographical works followed. The Hakluyt Society, named in his honor, was established in London in 1846 for the purpose of printing unpublished voyages and travels.

**Hakodate**, or **Hakodadi**, seaport and treaty port, Japan. It has a fine harbor, and is the center of the fishing trade with the Asiatic Coast. Marine products, timber, sulphur, dried fish, rice, and salt are exported; p. 164,000.

**Hal**, town, Belgium, near Brussels. It has a fine old Gothic church, begun 1341, celebrated for its miraculous image of the Vir-

gin, which has made it a place of pilgrimage. It produces sugar, paper and porcelain; p. 16,000.

**Halakha.** See **Talmud**.

**Halberstadt**, town, Saxony, at the foot of the Harz Mountains. Many of the houses date from the 15th and 16th centuries. Its most important buildings are the Cathedral (13th to 15th century), the churches of Our Lady (1135-46) and St. Martin (1350); the 14th century Town Hall, and the former episcopal residence. Industries include railway repair works and manufactures of sugar, paper, cigars, gloves, chemicals, and beer. Nearby is Klusberge, which has prehistoric cave dwellings; p. 48,300.

**Halbert**, or **Halberd**, a weapon, forming a spear and battle axe combined, which was in constant use during the 15th and 16th centuries, originating in Scandinavia and Germany. The blades vary in shape from a very narrow, curved, prong-like sort to the heavy, broad, double-edged examples.



*Head of Halbert.*

**Halcyone**, or **Halcyon**. See **Alcyone**.

**Haldane**, **Right Hon. Richard Burdon**, **FIRST VISCOUNT OF CLOAN** (1856-1928), British public official and philosophical writer. He took particular interest in the political position of women, in educational reform, and in military affairs. As Secretary of State for War he created the Territorial Army, a system that permitted of unlimited expansion in time of war. It was almost entirely due to his efforts and foresight that the British Expeditionary Force was prepared to take the field immediately on the opening of the World War. In 1912 he had been sent to Germany on a delicate diplomatic mission. He returned from that mission convinced that war between Germany and Great Britain was only a matter of time. He had once declared that Germany was his 'spiritual home,' referring to the philosophical knowledge he had acquired from that country. This was

remembered and used against him in uninformed British sections and he was literally 'hounded from office' by the clamor of yellow journalism. His published works include *Life of Adam Smith* (1887); *Education and Empire* (1902); *The Reign of Relativity* (1921).

**Haldeman**, **Samuel Stehman** (1812-80), American natural scientist and philologist. He examined various Indian dialects, Pennsylvania Dutch, Chinese, and other languages, and published, among other works on philology, *Affixes in Their Origin and Application* (1805); *Pennsylvania Dutch* (1872). He wrote about 200 papers on scientific subjects.

**Hale**, **Edward Everett** (1822-1909), American clergyman and author. From 1903 to the time of his death he was chaplain of the U. S. Senate. He was active in philanthropic enterprises, and his *Ten Times One Is Ten* (1870) was the starting point of a numerous series of 'Lend a Hand' clubs and similar benevolent organizations. He founded and edited *The Christian Examiner*, and *Old and New*, which was finally merged into the original *Scribner's Monthly*; edited *Lend a Hand*; and contributed voluminously to current periodicals. Among E. E. Hale's best-known works are: *The Man Without a Country* (1863), on which his fame as a writer of fiction chiefly rests; *In His Name* (1873); *A New England Boyhood* (1893). His *Collected Works* was published in 1901.

**Hale**, **George Ellery** (1868-1938), American astronomer. From 1904 he was director of the Carnegie Institution's solar observatory on Mount Wilson, Cal. His principal researches were in the domain of solar and stellar spectroscopy, and he became widely known as the inventor of the spectroheliograph. He wrote many papers on solar physics.

**Hale**, **Horatio** (1817-96), American ethnologist and philologist. Among his noteworthy papers are: *Ethnography and Philology*; *Indian Migrations as Evidenced by Language* (1882); *Origin of Languages and the Antiquity of Speaking Man* (1886); *The Development of Languages* (1888); *Language as a Test of Mental Capacity* (1891).

**Hale**, **Nathan** (1755-76), American Revolutionary soldier. In September, 1776, he volunteered to enter the British lines at New York to procure information for General Washington. Disguising himself as a Dutch schoolmaster, he made his way to Long Island, where he was detected, tried, and con-

demned, and executed as a spy, Sept. 22, 1776, his last words being, 'I only regret that I have but one life to lose for my country.' His youth and the courage with which he met death have made him a popular hero in America.

**Hale, Nathan** (1784-1863), American journalist, nephew of Nathan Hale, the patriot, and father of Edward Everett Hale. In 1814, with Henry D. Sedgwick, he became editor of the Boston *Weekly Messenger*, the first American literary and political weekly, and in the same year bought the Boston *Daily Advertiser*. Hale was also a founder of the *North American Review* (1815) and of the *Christian Examiner* (1823).

**Hale, Philip** (1854-1934), American music and dramatic critic. He studied the organ, composition, and pianoforte under European masters, and afterward was organist in various churches and conductor of the Schubert Male Chorus Club. He was editor of the *Musical Record* (1897-1901) and of the *Musical World* (1901-3), and from 1903 until his death acted as musical critic of the Boston *Herald*. The scholarly background and able style of his writings make them a contribution to musical literature.

**Hale, Sarah Josepha** (1790-1879), American author and editor, became the editor of *The Ladies' Magazine* in 1832, and after its amalgamation in 1838 with *Godey's Lady's Book*, continued as editor of the latter. She published: *Sketches of American Character* (1833); *Traits of American Life* (1835); *Letters of Lady Mary Wortley Montague* (1856), and other works.

**Hale, William Gardner** (1849-1928), American classical scholar, was one of the founders and the first director of the American School of Classical Studies at Rome, and was associate editor of *The Classical Review* (1895-1907) and of *The Classical Quarterly* (since 1907). His works include contributions to philological journals; *The Art of Reading Latin* (1887); *A Latin Grammar* (with C. D. Buck, 1903).

**Halévy, Jacques François Fromental Elie** (1799-1862), French operatic composer, was born at Paris, of a Jewish family whose real name was Levi. His first success, and the work by which he is remembered, was *La Juive* (1835), followed six months later by a comic opera, *L'Eclair*. The best of his subsequent operas were *Charles VI*. (1843); *La Reine de Chypre* (1844); *Les Mousquetaires de la Reine* (1846).

**Halévy, Ludovic** (1834-1908), French

dramatist and novelist. In 1864 he began his collaboration, which lasted for 17 years, with Henri Meilhac. They met with extraordinary success, their productions being mostly comic operas and *opéras bouffes*. Among the best known is *Carmen* (music by Bizet; 1875). They made a first attempt at more serious drama with *Fanny Lear* in 1868, which was followed in 1869 by *Frou-frou*. They were also responsible for lighter comedies. Halévy also won great success in another branch of writing, as a novelist, aided by grasp of character and sentiment, with *L'Abbé Constantin* (1882), *La Famille Cardinal* (1883), *Criquette* (1883), *Deux Mariages* (1883), *Princesse* (1886), *Kari-kari* (1892), and *Mariette* (1893).

**Halifax, Edward Frederick Lindley Wood**, 3rd. Viscount (1881- ), British statesman. He was Viceroy of India until 1931, president of the Board of Education 1932, and leader of the House of Lords until, on the resignation of Anthony Eden, he became foreign minister. He retained this office through the Munich era, and visited Germany in November 1937. December 23, 1940, he was appointed ambassador to the United States.

**Half Blood**, children of the same father by different mothers (*consanguineous*) or of the same mother by different fathers (*uterine*). See CONSANGUINITY.

**Half Moon**. See Hudson, Henry.

**Halibut**, or **Holibut**, the largest and most important member of the Flatfish family (Pleuronectidae). It has an elongated, thick body, deep mesially, and tapering markedly each way; the upper surface is covered with small dark brown scales, the under surface smooth and white. The head is broad, with both eyes on the upper side, and the mouth is large. Specimens of several hundred pounds are not uncommon; those of eighty pounds and less are judged best for food purposes. The halibut is found along both shores of the Northern Atlantic and Northern Pacific.

**Halicarnassus**, an ancient Greek city of Caria in Asia Minor. During the 4th century B.C. the city was the residence of a line of Carian princes, chief of whom was Mausolus, in whose honor his wife Artemisia erected the magnificent Mausoleum which was accounted one of the seven wonders of the world. The town was taken by Alexander the Great in 334 B.C. The site is occupied by the modern town of BUDRUM.

**Halicz**, town, Poland. Ruins of the medi-

æval castle of the princes of Halicz overlook the town; p. 4,957. During the Great War Halicz acquired considerable strategic importance as the key to Lemberg. It was first captured by the Russians late in August, 1914, and recaptured by the Teutons in June, 1915, in Von Mackensen's great drive. It was again occupied by the Russians on July 10, 1917.

**Halifax**, city, capital of Nova Scotia and the principal eastern seaport of Canada, is situated on Halifax Harbor, a deep inlet of the Atlantic Ocean, and one of the finest harbors in the world. Educational and philanthropic institutions include Dalhousie University, Nova Scotia Technical College, Presbyterian and Roman Catholic theological schools, Convent of the Sacred Heart, Victoria General Hospital, and Halifax Infirmary; p. 58,372.

Halifax, which was founded by a body of immigrants under Edward Cornwallis in 1749, and was incorporated in 1842, has had a romantic and a tragic history. It was a British loyalist center during the War of Independence and the War of 1812, and continued to be garrisoned by British troops until 1905, when defence was assumed by the Canadian government. On Dec. 6, 1917, a large area of the city of Halifax was laid waste, 1,500 persons were killed, 4,000 were seriously injured, and a property loss estimated at \$50,000,000 was inflicted by an explosion following the collision in Halifax Harbor of the French line steamship *Mont Blanc*, loaded with munitions, and the Norwegian relief ship, *Imo*. The work of restoration was assigned to a Federal commission.

**Halifax, Viscount (Edward Frederick Lindley Wood)** (1881- ), British statesman, was born in Garrowby, Yorkshire; educated at Eton and Oxford; in Parliament (1910); entered the cabinet as president of board of education (1922 and 1932); minister of agriculture (1924); viceroy of India (1926-31); war secretary (1935); lord privy seal (1936); secretary of state for foreign affairs (1937-41); ambassador to U. S. (1941-1946).

**Haliotis** (French *Ormer*), a genus of gastropod molluscs of the family Haliotidae, which includes the EAR SHELL of European coasts and the ABALONE of California. Most of the species are tropical or subtropical forms, and are valued for the beautiful iridescent lining of nacre of their shells, known as mother-of-pearl.

**Hall**, in architecture, is used in at least

four distinct senses: the chief apartment of a feudal castle, and later of a city mansion or country manor house, also of a college, inn of court, or guild; a city or country mansion of size and importance; a public building or large room in a public building, or one used for public entertainments; the room serving as vestibule in a public building, or by analogy the entrance room or passage in a private house. The hall of the king's palace, now called 'Westminster Hall,' built by William Rufus, and restored by Richard II., is the finest example in England, being 300 ft. long and 100 ft. broad.

**Hall, Asaph** (1829-1907), American astronomer was born in Goshen, Conn. He was sent on several important astronomical expeditions; discovered the two satellites of Mars in 1877.

**Hall, Charles Cuthbert** (1852-1908), American Presbyterian clergyman, was born in New York city. He held various pastorates until 1897 when he was chosen president of the Union Theological Seminary.

**Hall, Charles Francis** (1821-71), American Arctic explorer, was born at Rochester, N. H. In 1871, in the *Polaris*, Hall proceeded on a third Arctic voyage up to Smith Sound in lat. 82° 11' N. An official *Narrative of the Second Arctic Expedition* was published in 1879.

**Hall, Chester Moor** (1703-71), English optician, is known as the inventor of the achromatic telescope (1733).

**Hall, Granville Stanley** (1845-1924), American educator. He was professor of psychology at Johns Hopkins in 1884-88, when he was chosen president of Clark University, at Worcester, Mass. His works include: *Aspects of German Culture* (1881); *Adolescence* (1905); *Senescence* (1922).

**Hall, James** (1811-98), American geologist, born at Hingham, Massachusetts. Appointed to the Geological Survey of New York in 1836, he was placed in charge (1837) of the survey of the western part of the state. His report, published in 1843, laid the foundation for American stratigraphic geology and is regarded by geologists as a classic. It led to the permanent establishment of the office of state geologist. His chief work is *Palæontology of New York*, 1847.

**Hall of Fame**. See New York University.

**Hallam, Arthur Henry** (1811-33), English poet, son of Henry Hallam, the historian, was born in London. His early death inspired Tennyson's noble elegy of *In Memoriam*.



**Hallam, Henry** (1777-1859), English historian, born at Windsor. Among his great works are *View of the State of Europe during the Middle Ages* (1818). *The Constitutional History of England from the Accession of Henry VII. to the Death of George II.* (1827), and *Introduction to the Literature of Europe in the Fifteenth, Sixteenth, and Seventeenth Centuries* (1837-39).

**Halle**, or **Halle-an-der-Saale**, tn., Prussia. It is the seat of a famous university, founded in 1694, and conjoined with the University of Wittenberg in 1817. In the marketplace are the red tower (276 ft.), and a monument to Handel, a native of the town. The handsomest church is that of St. Maurice (12th to 16th century). Halle possesses also a cathedral (16th century); p. 202,000.

**Halleck, Fitz-Greene** (1790-1867), American poet, born at Guilford, Connecticut. He published the satirical series 'The Croakers' (with Joseph R. Drake) in the *New York Evening Post* (1819) and *Fanny* (1819), a satiric poem. His best poems are those on *Alnwick Castle* and *Burns*, and his *Marco Bozzaris*.

**Halleck, Henry Wager** (1815-72), American general, born at Westerville, New York. He held various administrative offices in California, and in 1849 was a member of the committee which drafted the state constitution. He planned the western campaign of 1862, was commander of the U. S. army (1862-64), and was then Gen. Grant's chief-of-staff until the close of the war. He published two excellent works, *Elements of Military Art and Science* (1846), much used during the Civil War; and *International Law* (1861).

**Hällefinta**, the name (Swedish) given to a compact metamorphic rock which consists of very small particles of quartz and feldspar, with sometimes chlorite, muscovite, iron ores, and other minerals as accessory constituents.

**Hallelujah**, a word which forms part of the praises both in Jewish and in Christian liturgies.

**Halley, Edmund** (1656-1742), English astronomer, was born at Haggerston, London. His stellar observations at St. Helena in 1676 earned him the title of the 'Southern Tycho,' and he promoted the publication of Newton's *Principia*. In 1698-1700 he investigated the variation of the compass in the Atlantic, and inferred the magnetic relations of auroras from his observations of the display on March 16, 1715. He predicted, in 1705, the return in 1759 of the comet of 1682, which

bears his name; advocated the determination of the solar parallax by transits of Venus; detected the 'long inequality' of Jupiter and Saturn, and the motions of the stars.

**Halliburton, Richard** (1900-1939), American author and traveler, born at Brownsville, Tennessee. He swam the Hellespont 1925; the Panama Canal 1928; Sea of Galilee 1931. He travelled over 50,000 m. around the world in his own airplane 'The Flying Carpet,' 1931-32, visiting Mount Everest by air. He is the author of *The Royal Road to Romance* (1925); *New Worlds to Conquer* (1929); *The Flying Carpet* (1932).

**Halloween, Halloweven, or All Hallowe'en**, the popular name for October 31, the vigil of the feast of All Saints, otherwise All Hallows. In Roman Catholic countries Halloweve is the occasion for visiting the cemeteries and laying flowers on the graves of friends and relatives. In Great Britain and the United States the night is devoted to merry-making and divination of the future.

**Hallström, Per** (1866), Swedish author, born at Stockholm. Hallström is one of the finest of Swedish stylists. Chief works: *Välsna Faglar* (1894); *Purpur* (1895); *Thanatos* (1901); *Döda Fallet* (1902).

**Hallucination** has been defined as 'perception without an object'—there is consciousness of an apparently external object when no such object exists.

**Halo**, in meteorology, a colored ring, with the red inside, surrounding the sun or moon, is due to the refractive power of ice crystals in the air. The smaller circular bands of spectral colors with the red outside are known as 'coronæ,' and are due to the light passing through very minute globules of water. Sir Isaac Newton attributed halos to 'some sort of hail or snow floating in the air in a horizontal position, the refracting angle being about 58° or 60°.

**Halo**, or **Nimbus**, in art a disc or similar symbol, usually encircling the head of a sacred personage. It was the attribute of gods and heroes among the Egyptians, Persians and Hindus; the Greeks applied it especially to their gods of light, and the Romans to deified Emperors. When a glory surrounds the whole figure, as it only does those of Christ and the Virgin, or of saints represented as ascending into heaven, it is called an 'aureole.'

**Halogens**, a name given, in chemistry, to a group of four elements of very similar properties—fluorine, chlorine, bromine, and iodine.

**Hals. Franz** (1580-1666), Dutch portrait

painter, born at Antwerp, but settled in Haarlem (1616). In the Dutch school he was the pioneer of free, broad brush-work; famous also for his masterly juxtaposition of flesh-tints. His finest portrait groups of *Companies of Archers*, of *Civic Guards*, are in the Haarlem Museum.

**Halsey**, William F., Jr. (1882- ), Admiral in the U. S. Navy. Under Admiral Chester L. Nimitz he commanded in W.W. II U. S. naval forces in the S. Pacific.

**Ham**, one of the three sons of Noah, and the ancestor of the Hamitic family.

**Ham**, tn., dep. Somme, France. Its medieval castle was the prison where Louis Na-

**Hamath**, a Syrian city on the Orontes, between Damascus and Aleppo. It was one of the chief towns of the Hittites, and was finally conquered by the Assyrians in the 8th century B.C. It has always been an important place on the trade route from Assyria to Egypt; p. 60,000.

**Hamblin**, Thomas Somerby (1800-53), American actor, was born near London, England. He was manager of various theatres in New York City, among them the Bowery, New Bowery, and Park. He was a patron of standard drama, and sometimes appeared in the same cast with the elder Booth, Forrest, and Cooper.



*Westminster Hall.*

oleon (Napoleon III.) was confined from 1840 to 1846. During the World War Ham was occupied by the Germans from 1914 to 1918 and the castle destroyed; p. 4,000.

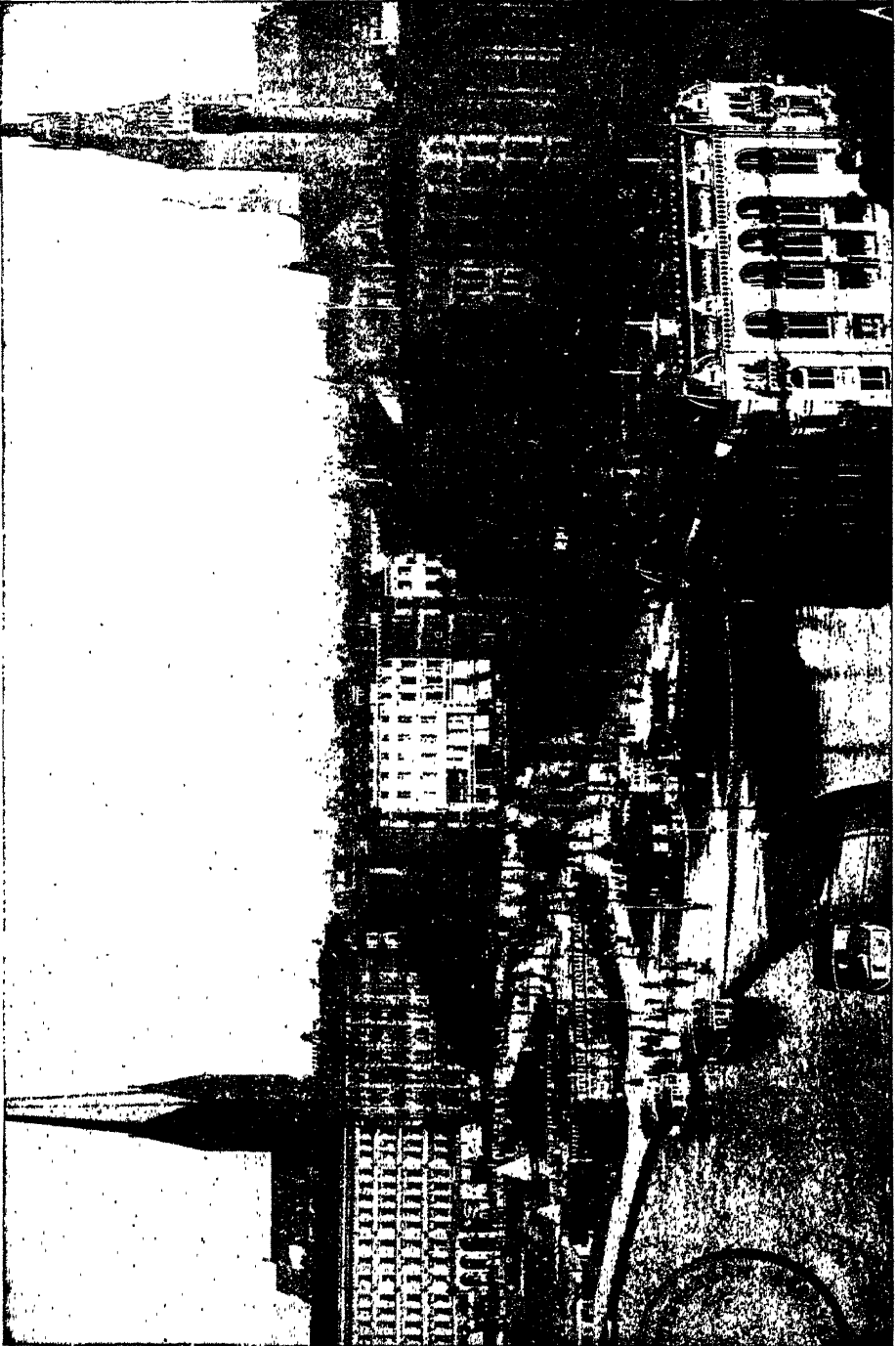
**Hamadan**, tn. in w. of prov. Irak-Ajemi, Persia. It is supposed to stand on the site of the ancient Ecbatana, and among its tombs the Jews still show the reputed burial-places of Esther and Mordecai. In the World War it was the scene of much fighting; p. about 30,000.

**Hamadryad**, or **King Cobra**, or **Giant Cobra**, a large and very poisonous snake, found in India, S. China, and the Philippines. It may reach a length of twelve feet or more, and apparently lives entirely on other snakes. The color is yellowish, with more or less distinct black cross-bands.

**Hamburg**, state, Germany, lying mostly on the lower Elbe between Schleswig-Holstein and Hanover; area 160 sq. m. The state and the city of Hamburg constitute a republic, with a constitution dating from January, 1921; p. 2,000,000.

**Hamburg**, important seaport, and second largest city of Germany, in the state of Hamburg.

Hamburg is a modern town in appearance, having been practically rebuilt since a destructive fire in 1842. The chief street is the Jungfernstieg, a handsome, busy thoroughfare. The Neumarkt and the Alterwall near the Exchange are the chief commercial centers, while the Rodingsmarkt and the Katharinestrasse contain the finest of the older residences. The Kaiser-Wilhelm-Strasse is the



*Photo from Publishers Photo Service.*

HAMBURG, GERMANY

most important of the new streets. Among the more noteworthy buildings are the Rathaus, erected in 1886-97, the Bourse, the churches of St. Nicholas, whose west tower is one of the loftiest in Europe, St. Katharine, St. Peter and St. Michael; and Chile House and Ballin House, two handsome modern office buildings. The city has several fine galleries and museums, chief among which are the Zoölogical Museum, the State and University Library, Museum of Hamburg Antiquities erected in 1914-20, Ethnological Museum, the Kunsthalle, with a large but rather mediocre collection of paintings, and the Museum of Arts and Crafts. The Botanical and Zoölogical Gardens are interesting and attractive and there are many public parks, beer gardens and open spaces. Several bridges span the Elbe.

The harbor, the greater part of which constitutes a free port, is one of the best and busiest on the European continent. By the Treaty of Versailles, harbor accommodation in the Port of Hamburg was given for 99 years to Czechoslovakia.

Hamburg seems to have been originally founded early in the 9th century, and under Archbishop Ansgar became, about the middle of that century, the disseminator of Christianity through North Europe. After frequent pillagings and burnings from Northmen, Danes, and Slavs (Wends, etc.), the city began toward the end of the 12th century to be frequented as a trade center. Toward the middle of the following century it was united with Lübeck and Bremen (to which the arch-episcopal see was transferred in 1223), and thus became a participator in the Hanseatic League. Another impulse was imparted to its commercial importance in 1619, when the Bank of Hamburg was founded; and about this time there settled in the town English merchant adventurers, and numberless Jews expelled from Spain and Portugal. In 1806 the town was occupied by the French, and during 1813-14 very harshly treated by their general, Davout; but it has prospered since the treaty of Vienna (1815), by which it regained its independence. Beginning on April 8, 1933 the parliamentary system of government was abolished by Chancellor Hitler. The city occupies a distinguished place in the history of German literature and the drama, having been the home of many great German writers; p. 1,647,000. Repeatedly bombed by the Allies in World War II, the city lay in ruins by summer, 1943.

**Hameln**, town in the Prussian province

of Hanover, on the Weser, with many mediæval houses. It is famous for the legend of the Pied Piper, versified by Browning, and said to be founded on an authentic incident of June 26, 1284. It is noted for its salmon fisheries; p. 28,000.

**Hamerik, Asger** (1843-1923), Danish composer, born in Copenhagen. He received a gold medal for his *Hymne de la paix*, which was especially remarkable for its orchestration. He wrote two operas, *Tovelille* and *Hjalmar et Ingeborg*, while in Paris, and a third, *La Vendetta*, during a tour in Italy (1870). The opera *Der Wanderer* appeared in 1872. He went to the United States in 1870, and was for many years director of the Peabody Conservatory in Baltimore, and of the Peabody symphony concerts.

**Hamilcar**, the name of several generals of ancient Carthage, the most notable of whom was Hamilcar Barca, the father of Hannibal, to whose family the designation 'Barcine' was afterward attached. He took command of the Carthaginian forces in Sicily during the first Punic War in 247 B.C., and maintained his position near Panormus (Palermo) in spite of all the endeavors of the Romans to expel him, abandoning the island only after the Roman naval victory off the Ægæan islands in 241 B.C.

**Hamilton**, city, Ontario. It is situated in the midst of a fertile horticultural and agricultural region, and has excellent shipping facilities. It is the seat of sees of the Roman Catholic bishop of Hamilton and the Anglican bishop of Niagara. Hamilton has been called 'The Birmingham of Canada,' its factories being engaged in the manufacture of steel, iron, cotton, and woolen goods, agricultural machinery, electrical equipment, ploughs, boots, furniture, and other commodities. The surrounding country is traditionally connected with the adventures and exploration of La Salle and his companions in 1669. It was later settled by Loyalists from the United States. The city itself was founded in 1813 by George Hamilton, and was incorporated in 1846; p. 125,000.

**Hamilton**, town, Mid-Lanarkshire, Scotland. It is the center of a rich coal and iron field. Hamilton Palace, the seat of the dukes of Hamilton, stands near the town; p. 41,100.

**Hamilton Mountain**, California, 25 m. e. of San José, 4,209 ft. high. Here is situated Lick Observatory.

**Hamilton**, a noble Scottish family, tracing its history back to Walter de Hamilton, or Walter Fitzgilbert, who obtained from

Robert Bruce the barony of Cadzow, in Lanarkshire. From Walter's second son are descended the Hamiltons, earls of Haddington, of whom the most notable was Thomas, Earl of Melrose, and first Earl of Haddington (1563-1637), a distinguished lawyer during the reign of James VI. The founder of the exceptional fortunes of the senior branch was Sir James, first Baron Hamilton (d. 1479), son of Sir James, fifth baron of Cadzow.

**Hamilton, Alexander** (1757-1804), one of the greatest of American statesmen. He was born on the island of Nevis, West Indies, on Jan. 11, 1757, and was probably the natural son of James Hamilton, a Scotchman, and Rachael Levine, a woman of Huguenot descent, who had separated from her husband, John Levine, a Dane. He first attracted attention by an impromptu speech delivered before a mass meeting in New York on July 6, 1774. In opposition to the famous pamphlets signed 'A Westchester Farmer,' he wrote between Nov., 1774, and Jan., 1775, two pamphlets, *A Full Vindication of the Measures of the Congress from the Calumnies of Their Enemies, and The Farmer Refuted*, which had much influence and were astonishing as coming from a boy of eighteen. He was a member of the Continental Congress (Nov., 1782-Aug., 1783), of the Annapolis Convention (1786), whose report recommending a general convention he drafted, and of the Constitutional Convention in Philadelphia (1787), before which he urged, with futile brilliancy, a degree of centralization which his fellow-delegates were not prepared to accept. In the final result, however, his influence is unmistakably seen, and to him more than to any one else was due New York's ratification of the instrument as adopted; his influence being exerted both through the state convention, of which he was a member, and through a series of papers, later collected as *The Federalist* (to which Madison and Jay also contributed), which rank among the ablest political essays in the language. (See *FEDERALIST, THE*.) He was a member of Congress (1787-8), and from 1789 to 1795, as the first United States Secretary of the Treasury, was the strongest constructive force in Washington's administrations.

Besides organizing his department along general lines which have endured until today, he devised and recommended measures which established the public credit on a firm basis, and served to counteract the disintegrating tendencies among the states and to consolidate the union. The most important of these

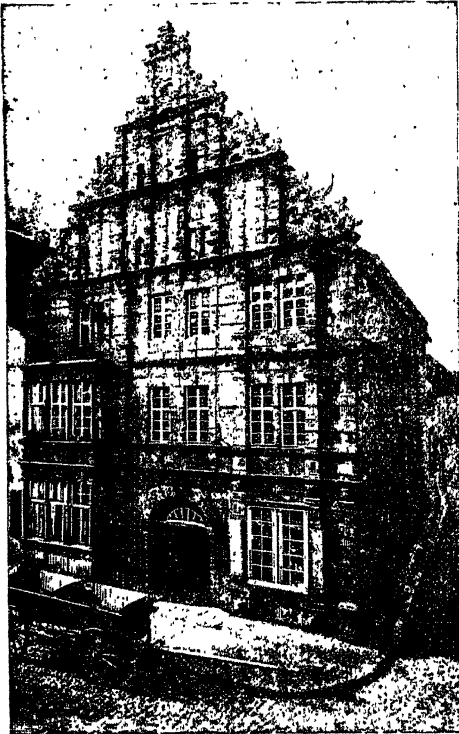
measures were those for funding the public debt, for the Federal assumption of state debts, incurred because of the war, and for the establishment of a national bank. His report (1790) *On Public Credit* is said to have 'laid the cornerstone of American finance under the Constitution,' and his report *On Manufactures*, has supplied with arguments many an advocate of the diversification of industries by government aid. In contending against Jefferson and others, for the constitutionality of a national bank, he made the first effective use of an argument of far-reaching importance, that the Constitution by implication granted to the government all powers which were not specifically prohibited and which were necessary for the discharge of such powers as were specifically granted. This, the doctrine of 'implied powers,' later, in the decision of *McCulloch vs. Maryland* (1819) received the sanction of John Marshall and the United States Supreme Court. The imposition of an excise, recommended by Hamilton, brought on the 'Whisky Rebellion,' the quelling of which gave the central government a chance to demonstrate its power. In foreign as well as domestic affairs Hamilton's influence was felt; he counteracted the effusive zeal of the pro-French party, and advocated the ratification of the bitterly assailed Jay treaty with Great Britain. Politically, after parties had definitely formed, he was the leader of the Federalists. Burr, on a trivial pretext, beguiled him into a duel (July 11, 1804) at Weehawken, N. J., opposite New York, and mortally wounded him at the first fire. Hamilton died on the following day, July 12, 1804.

Hamilton was a great constructive statesman, a deviser of measures, a framer of policies, rather than distinctively a manager of men. Washington and Lincoln excepted, probably no man has rendered as great services to the nation. See Hamilton's works, edited by Lodge (9 vols. 1885-6), and *Lives* by Morse (2 v. 1876), by Shea (1897), by Lodge (1882); and by Sumner (1890).

**Hamilton, Andrew** (c. 1676-1741), American lawyer, was born in Scotland. He became famous for his defense of the New York printer, Peter Zenger, who was arrested for libelling the government. Hamilton claimed that Zenger's statements were true, and therefore not libelous, and the jury returned a verdict of not guilty, thereby going far to establish the freedom of the press in America.

**Hamilton, Emma, Lady**, née Amy Lyon (?1761-1815), a native of Cheshire. Her

extraordinary beauty (immortalized in many portraits by Romney), her social charm, and her friendship with the queen of Naples, made her the leading figure in that city, and gave her great political influence, which she used with equal loyalty to Naples and to Britain.



*The Rat Catcher's House, Hameln.*

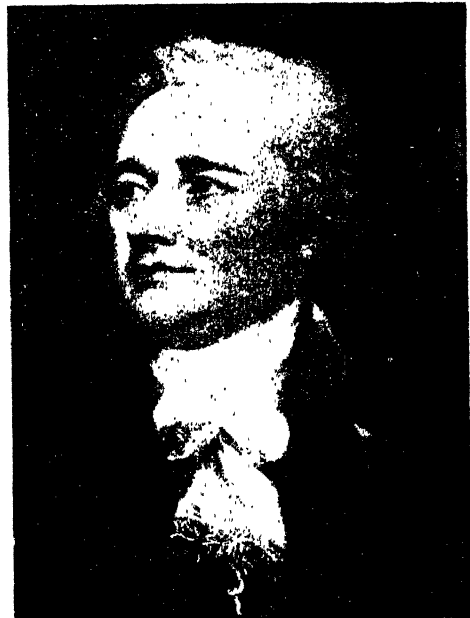
Her story is one with that of Lord Nelson, her lover. See E. Barrington *The Divine Lady* (1925).

**Hamilton, Sir Ian Standish Monteith** (1853- ), British general, was born in the island of Corfu. He entered the army in 1872, and saw service in Afghanistan (1878-80), in South Africa (1881), with the Nile expedition (1884-5), with the Burmese expedition (1886-7), and with Sir R. Low's Chitral relief force (1895). On the outbreak of the Boer war, Hamilton was appointed chief of the staff of the Natal Field Force, then under Sir George White; and subsequently to the command of a brigade of infantry. He commanded at Elands-laagte (Oct. 21, 1899), where he displayed conspicuous gallantry. In the defense of Ladysmith he was in command of the position of Caesar's Camp at Waggon

Hill, and on Jan. 6, 1900, was forced to bear the brunt of the fierce Boer attack. In 1915 he commanded the Mediterranean Expeditionary Force. His published works include *Icarus* (1886), *A Jaunt in a Junk* (1884), *The Millennium* (1918), *Gallipoli Diary* (1920).

**Hamilton, James** (1769-1829), British educator, was born in London. In 1815 he went to New York, where he established himself as a teacher of languages, introducing a method which he had himself adopted from General D'Angeli, a French émigré—teaching by literal translation rather than by insistence upon grammar. The new system soon gained favor and Hamilton became extraordinarily successful.

**Hamilton, James** (1786-1857), American legislator, was born in Charleston, S. C. He went to Texas, and in 1841 secured the recognition of that republic by England and France. He was elected to the U. S. Senate from Texas in 1857.



*Alexander Hamilton.*

**Hamilton, John McLure** (1853-1936), American portrait-painter, was born of English parents in Philadelphia. His two famous portraits of Gladstone are in the Luxembourg, Paris, and the Pennsylvania Academy of Fine Arts, where, also, is his portrait of Richard Vaux. Other notable portraits are of Mrs.

Gladstone, Bismarck, Cardinal Manning, John Tyndall, Herbert Spencer, G. F. Watts, and Sir Frederick Leighton.

**Hamilton, Sir William** (1730-1803), British ambassador and antiquarian, was born in Scotland. In 1791 he married Emma Lyon, who, as Lady Hamilton, was the mistress of Lord Nelson.

**Hamilton College**, a non-sectarian institution of higher learning situated in Clinton, N. Y. It was founded in 1793, chartered in 1812, and named for Alexander Hamilton, its first trustee.

**Hamites.** See **Ham**.

**Hamlet**, one of the best known and profoundest of Shakespeare's tragedies, founded upon a legend in the Latin history of Denmark by Saxo-Grammaticus, 12th century.

**Hamline University**, a Methodist Episcopal co-educational institution in St. Paul, Minn., founded in 1854. It was first located in Red Wing, but the present college was opened in St. Paul in 1880.

**Hammer**, a tool with a heavy, blunt head of steel, used for striking blows. Hand hammers have a wooden handle or shaft proportioned to the weight of the head. See **STREAM AND PNEUMATIC HAMMERS**.

**Hammerfest**, seaport town, Finnmark, Norway, the most northerly port in the world, is situated on the island of Kvalø, in 70° 39' 15" N. lat. It has an excellent harbor and shares in the Spitzbergen whale fisheries. Cod-liver oil is produced in abundance. A small granite column, known as the Meridianstettin, crowned with a bronze globe, has been here erected as a memorial to the Russian, Norwegian, and Swedish geometers who measured the Arc of the Meridian here in 1816-52. The 'midnight sun' may be observed at Hammerfest from May 13 to July 29; p. 3,336.

**Hammer-headed Shark**, any shark of the family *Sphyrnidae*, which inhabits all the warmer seas. The special peculiarity is that the head is broad, flattened, and expanded on each side into a process resembling the head of a hammer, on the flat terminal surface of which the eyes are placed.

**Hammersmith**, metropolitan borough of London, England, on the Thames. Features of interest are St. Paul's School, the Olympia, a huge entertainment building, which in 1914 was used as a concentration camp for interned aliens and later as an Army Service Corps depot; Dove's Inn, in which tradition says Thomson wrote part of his *Seasons*; and a number of picturesque houses of the 18th

and 19th centuries. Here William Morris established the Kelmscott Press; p. 135,521.

**Hammerstein, Oscar** (1847-1919), American theatrical and operatic producer, was born in Berlin, Germany, and went to the United States when he was sixteen. In 1870 he leased and managed the Stadt Theatre in New York, and in 1888 built the Harlem Opera House. He later built the Olympia, afterwards known as the New York Theatre, the Belasco, and the Victoria, and in 1906 opened the Manhattan Opera House for the production of grand opera. Financial difficulties arising because of competition with the Metropolitan Opera House caused him in 1910 to sell his interests.

**Hammock**, a swinging bed or couch, usually made of netting or canvas, suspended at each end by a number of cords called 'clews,' brought together and fastened to iron rings.

**Hammond**, city, Indiana, Lake co. The chief manufactures are passenger and freight cars, stock and poultry food, surgical instruments, pianos, clothing, and machinery. There is also a large book bindery. Truck gardening is extensively carried on in the vicinity. The city was settled in 1869 and incorporated about 1885; p. 70,184.

**Hammond, James Bartlett** (1839-1913), American inventor, was born in Boston, Mass. He was a newspaper correspondent during the Civil War and patented (1880) the 'Hammond typewriter.'

**Hammond, John Hays** (1855-1936), American mining engineer, was born in San Francisco. He served on the U. S. Geological Survey and the Mineral Census for the California gold-fields, and was engaged in mining engineering in the West and South and in Mexico. He was special ambassador to the coronation of King George V. in 1911; president of the Panama-Pacific Exposition Committee to Europe in 1912; chairman of the World Court Congress in 1914-15, and chairman of the U. S. Coal Commission in 1923-4.

**Hammond, William Alexander** (1828-1900), American neurologist, was born in Annapolis, Md. In 1867-73 he was a member of the faculty of Bellevue Hospital Medical College in New York City, and in 1873-82 of New York University. He was one of the founders of the New York Post-Graduate Medical School, and was professor of mental and nervous diseases there. He was also one of the founders of the *New York Medical Journal*.

**Hammurabi.** See **Khammurabi**.

**Hampden, Walter** (1879- ), Ameri-

can actor, was born in Brooklyn, N. Y. His first stage appearance was in classical repertoire in London, 1901, after which he was leading man at the Adelphi Theatre, London, for three seasons. In 1905 he succeeded the younger Irving in *Hamlet*. Two years later he returned to the United States, where he appeared in *The Servant in the House*, *The Yellow Jacket*, *Salome*, *Caliban*, *Cyrano de Bergerac*, *Caponsacchi*, *An Enemy of the People*, and Shakespearean rôles. His greatest single triumph has been *Cyrano de Bergerac*, which was judged to be the outstanding play in New York City during 1923-24.

**Hampden-Sidney College**, an educational institution for men, at Hampden-Sidney, Virginia, was organized in 1775, and incorporated in 1783.

**Hampshire, Hants, or Southampton**, maritime county in the s. of England, having an area, with the Isle of Wight, of 1,654 sq. m. The coast is broken by the deep inlets of Langston and Portsmouth harbors, Southampton Water, and Christ Church and Poole Bays. In the s.w. is the New Forest; in the e. are Bere and Woolmer forests. Agriculture and market-gardening are the principal industries; p. 910,333.

**Hampstead**, metropolitan borough of London, England. Interest centers in what is known as Old Hampstead, where lived John Keats, John Constable, Joanna Baillie, George du Maurier, Robert Louis Stevenson, Sir Walter Besant, Pope, Steel, Addison, and other famous folk; p. 86,080.

**Hampton**, city, Virginia, county seat of Elizabeth City co. Here are the Hampton Normal and Agricultural Institute for colored boys and girls, Langley Field of the U. S. aeroplane service, a National Soldiers' Home, and National Cemetery. Fort Monroe is a nearby point of interest. Fish and oysters are shipped from the town and there are manufactures of brick and fish oil. Hamilton was settled in 1610. It suffered destruction in the Revolutionary War, and during the war of 1812 was attacked and partly burned by the British. In 1861 it suffered by fire from the Confederate force under General Magruder; p. 5,898.

**Hampton, Wade** (1818-1902), American soldier, was born in Columbia, S. C. Though opposed to secession, he joined the Confederate army, and raised a force called 'Hampton's Legion,' which he led with distinction at the first battle of Bull Run. He later took part in the battles of Seven Pines, Antietam, and Gettysburg, and during Sherman's ad-

vance from Savannah, 1865, commanded the cavalry forming the Confederate rear guard. In 1877 he became governor of South Carolina; was U. S. Senator from 1879 to 1891, and U. S. Commissioner of Railroads from 1893 to 1897.

**Hampton Normal and Agricultural Institute**, a non-sectarian school for the education of Indians and Negroes at Hampton, Virginia, opened in 1868 under the auspices of the American Missionary Association, and chartered in 1870. The work of the Institute is organized in five distinct vocational schools—agricultural, business, home-economics, normal and trade, and an academy.

**Hampton Roads**, channel connecting Chesapeake Bay and the James River, Virginia. Norfolk and Portsmouth harbors are on the s.; Hampton is on the n. The entrance is defended by Fort Monroe and Fort Wool.

**Hampton Roads, Battle of**, a famous naval battle of the American Civil War. At the opening of the War, the Confederates converted the wooden 40-gun frigate *Merrimac* into an ironclad, and renamed her the *Virginia*. On March 8, 1862, she entered Hampton Roads with 5 other vessels, and gave battle to the Federal fleet of 5 ships, disabling the *Congress*, and ramming the *Cumberland* so that she sunk. On March 9th, attempting to complete the destruction of the Federal fleet, she encountered the *Monitor*, an iron turret-ship. The action began at 8.30 A.M., and, after a long combat, ended in a drawn battle; but the *Virginia* withdrew, and the rest of the fleet was saved. Consult Porter's *Naval History of the Civil War*.

**Hampton Roads Conference**, an informal conference held Feb. 3, 1865, on board a vessel in Hampton Roads, near Fort Monroe, Va., between United States and Confederate representatives for considering means of bringing the Civil War to a close. President Lincoln offered liberal terms as the basis for a cessation of hostilities, but refused to recognize the Confederacy as an independent government or to modify the Emancipation Proclamation, and the conference came to nothing.

**Hamster**, a large gregarious rodent of the Old World, with a short tail and pouched cheeks, belonging to the genus *Circetus*.

**Hamsun**, Knut (1859- ), Norwegian author, was born in Lom, and spent his early boyhood on the Lofoten Islands, Nordland. After a disastrous attempt to fit himself into the life at the University of Christiania, in the



hope of gaining a much desired education, he went to America, and there worked in the wheatfields of North Dakota, as a street car conductor in Chicago, and on a Newfoundland fishing boat. In 1888 he returned to Christiania, and in 1889 published *Intellectual Life in Modern America*, a scathing and brilliant criticism of American culture. This was followed in 1890 by *Hunger*, and Ham-sun's reputation was at once assured. In 1920 he received the Nobel prize for literature. His published works include *Mysteries* (1892); *Shallow Soil* (1893); *Pan* (1894); *Victoria* (1898); *Dreamers* (1904); *Children of the Age* (1913); *Growth of the Soil* (1917); *Women at the Pump* (1920).

**Han**, river, China, a tributary of the Yangtse-kiang, which it joins at Hankow. It is navigable, for a portion of the year, as far as Siang-yang, about 300 m., but boats of small size can come down from Sinpuwan, near its source. Navigation is difficult and dangerous on account of the shifting sands.

**Hancock**, city, Michigan, Houghton co. It is connected with Keweenaw Bay on the s.e. by the Portage River, and a ship canal leads directly to Lake Superior on the n. Hancock is the seat of the Finnish Lutheran Seminary. In the vicinity are exceedingly rich copper mines, and the town has smelting furnaces, stamping mills, and machine shops; p. 5,554.

**Hancock, John** (1737-93), American statesman, was born in what is now Quincy, Mass. From 1766 to 1772 he was a member of the Massachusetts General Court, and in that body as well as outside was one of the leaders of the opposition to the arbitrary measures of the British ministry directed against the colonists; in 1774 and again in 1775 he presided over the extra-legal provincial congress of Massachusetts, and it was partly to apprehend him that the expedition of April 18-19, 1775, was sent from Boston to Lexington and Concord. Hancock was a member of the Continental Congress, 1775-80 and 1785-6, was its president in May, 1775-Oct., 1777 (signing the Declaration of Independence), and was again elected president in 1785, but on account of illness did not serve. He was also a member of the Massachusetts constitutional convention of 1780, and was the first governor of the state under the new constitution, 1780-5, serving again as governor from 1787 until his death.

**Hancock, Winfield Scott** (1824-86), American soldier, born in Montgomery co., Pa. He was appointed brigadier-general of

volunteers at the outbreak of the Civil War, and greatly distinguished himself as commander of the first division of the 2d corps at Antietam, at Fredericksburg in the assault upon Marye's Heights, and at Chancellorsville. At Gettysburg, besides being largely responsible for the choice of that battlefield, he commanded the left center on the second and third days and repulsed the famous final assault of Pickett and Pettigrew, during which he was severely wounded. Resuming his command in March, 1864, he fought with his usual skill and brilliancy in the battles of the Wilderness and Spottsylvania Court House, at Cold Harbor and at Petersburg. He was appointed brigadier-general in the regular army, 1864, and major-general, 1866, commanded for a time the Fifth Military district comprising Louisiana and Texas, his policy being liberal and conciliatory; and from 1872 until his death on Governor's Island, N. Y., he commanded the Division of the Atlantic. See F. A. Walker's *General Hancock* (1894).

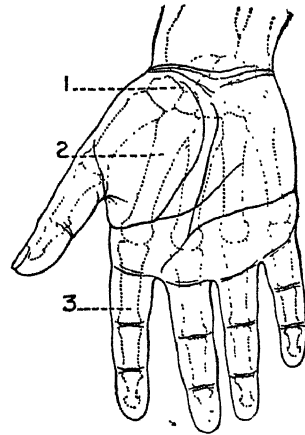


Diagram of the Hand.

1, Carpal bones; 2, Metacarpal; 3, Phalanges.

**Hand.** The manus, or hand, is the terminal segment of the anterior limb of many vertebrates. The name is, however, usually applied to the human manus, as distinguished from that of lower animals. Its skeleton consists of eight carpal or wrist bones, five metacarpal or palmar bones, and fourteen phalanges, three of which are in each finger and two in the thumb. The large number of muscles and joints in the hand allows of movements of great delicacy and intricacy and at the same time of considerable strength, while

the nerve supply is so rich as to render the hand the principal organ of the sense of touch.

**Handball** is a game played by two persons in an enclosed court, about 60 ft. long and 25 ft. wide, with walls 30 ft. high. A rubber ball  $1\frac{7}{8}$  inches in diameter, weighing  $15\frac{1}{2}$  ounces, is batted with the hand by one player against one of the walls, and on rebounding is struck in the same way by the other player. This continues until one player misses, when the other scores one point or ace. The server stands on a line (ace line) 30 ft. distant and parallel to the front wall, and his opponent stands further back ready to strike the ball and return it to the same wall. A player serving continues to do so until he fails to score an ace, when his opponent takes the service. Twenty-one aces constitute a game, the player scoring this number first winning. See Spalding's *Official Handball Guide* (1930).

**Handcuffs**, for securing prisoners, usually consist of two divided metal rings, adjustable to wrists of different sizes, and connected by a short chain, being used either to fasten the hands of the prisoner together, or to secure him to the wrist of the officer in charge.

**Handel** (in German **Händel**), **George Frederick** (1685-1759), musical composer, was born at Halle-an-der-Saale, Lower Saxony. He early showed a strong predilection for music, and in 1703 he became a violinist in the opera at Hamburg. Having produced four operas at Hamburg, he undertook a journey to Italy, 1707-10, to study what were then regarded as the classical models of composition. What he there learned colored his style for the rest of his life. His first real Italian opera, *Rodrigo*, produced at Florence, 1707, was followed by *Agrippina*, produced at Venice, 1708, and an oratorio, *La Ressurrezione*, supposed to have been performed in the palace of Cardinal Ottoboni at Rome, 1708. His first appearance in England was with *Rinaldo*, produced at the Haymarket, February 1711. The peace of Utrecht led to the composition of his first works set to English words, a *Te Deum* and a *Jubilate*, performed in St. Paul's Cathedral, July 1713. He found a patron in the Duke of Chandos, who employed him to direct the music at his private chapel at Cannons Park, near Edgware. Here he produced the *Chandos Anthems*, two settings of the *Te Deum*, his first English oratorio *Esther*, the pastoral *Acis and Galatea*, and the first set of *Suites de Pièces*. Leaving Cannons Park, he became

director of a new operatic venture called 'The Royal Academy of Music,' for which he wrote no fewer than fourteen operas, among them *Ottone*, with its familiar gavotte, and *Scipio*, with its still popular march. This venture collapsed and after one more such venture the composer's attention was directed almost solely to oratorio. *Saul* was produced in 1739, and *Israel in Egypt*, some months later. On April 13, 1742, the *Messiah* was produced in Dublin. This splendid work was written in the short period of twenty-



George Frederick Handel.

four days. Another oratorio, *Samson*, was given in London in February 1743. The most important of the later works were *Judas Maccabæus* (1746), *Joshua* (1747), *Solomon* (1748), *Theodora* (1749), and *Jephthah* (1751). During the last seven or eight years of his life Handel was afflicted with total blindness. He died in London, and was buried in Westminster Abbey.

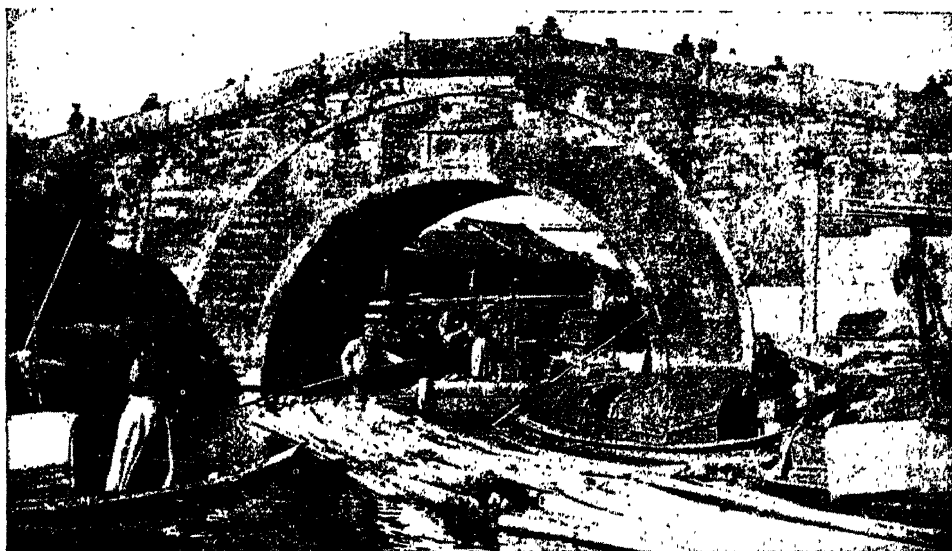
In person, as in character, Handel was large and powerful. His temper was volcanic, but a deep religious sense was one of his strongest characteristics. As a composer he is seen at his best in his oratorios, notably in the choruses. No one has ever better understood how to get great choral effects by simple means. His style is direct and vigorous, not lacking in dramatic power, and occasionally, as in some of his oratorio airs, marked by deep emotional feeling.

**Handicap**, a means employed in sports to

make equal the chances of competitors. Handicaps take various forms. In some cases an additional weight has to be carried, as in horse-racing; in others a greater distance has to be covered, as in foot-races; in others, again, a shorter time is allowed for covering the same distance, as in some yacht races. Other forms of handicap are used in polo, where some of the competitors have to make a greater number of goals in accordance with their rating; in cricket, where the number of players on one side is sometimes less than the number on the other; in billiards, where one player may have to make a

head tackle is provided to hoist them out of the water when required.

The hangars in which the great dirigibles are housed are of enormous proportions, the Navy hangar at Lakehurst, N. J., being 803 ft. long, 264 ft. wide, and 190 ft. high. It is intended to shelter two airships side by side. The walls of this great hangar are of corrugated asbestos upon steel framework. Abundant window openings pierce the sides, and there are great skylights in the roof. Doors are provided at both ends, and constitute the particular engineering feature of the structure, as, on account of their great height they



HANGCHOW, CHINA: Log raft passing under bridge on way to the mill.

greater number of points than another, and so on. Successful handicapping depends on the maintenance of complete records of the accomplishments of participants in competitions, and then having them passed upon by an expert individual or committee with wide powers. See HORSE RACING.

**Hangar**, a shelter in which airplanes, flying boats and airships are housed. At flying fields temporary hangars are often simple tents of canvas, or a canvas covering supported by a frame of wood, which may be jointed so as to be portable. Permanent hangars, however, are generally of steel, or a combination of brick, steel and glass. The floors are of rammed earth, wood, concrete, or preferably rolled cinders. Flying boats are housed in hangars built over a basin so that they may be floated out and in; and over-

present an immense surface to the wind when open, and are thus in danger of being overthrown by even a moderate breeze.

At the Lakehurst hangar the doors are in pairs, sliding open both ways from the center. Like the side walls they are of asbestos and steel and each door weighs 800 tons. They are mounted on wheeled trucks, similar to those in use on railroad cars, and travel on a railroad laid laterally across the front of the building. To withstand the overturning force of the wind buttresses reach out at right-angles to the plane of the doors 75 ft. to trucks travelling on a section of track laid at that distance.

Lengthwise upon the floor of the hangar and extending 1,500 ft. beyond it at both ends are sections of railroad to which the airship is attached movably when it is to

be run into the hangar, the power for this purpose being furnished by trolleys working through slots between the rails. At the Lakehurst hangar a mooring mast has also been erected, and to this the airship is fastened by the bow, to swing freely in the wind, when it is not immediately to be placed in the hangar. Orly, France, has a unique airplane shed in that it is constructed of concrete, while Germany has one which revolves so that it can be turned in the direction of the wind to facilitate the handling of the planes in housing them.

**Hangchow**, city, China, capital of Chekiang province, on the left bank of the Tsien-tang river. It is one of the most picturesque cities in China; the streets are broad and clean; there are numerous parks and gardens and many fine buildings. Along the western side of the city lies Lake Si-wu, also known as West Lake, in which is Imperial Island, and on the shores of which are several famous temples and shrines. Hangchow is surrounded by brick walls pierced by ten gates. The European and Japanese concessions lie outside the walls to the s. The temples and pagodas are the most interesting buildings of the city. The most notable industries are the manufacture of silk and the making of 'joss' paper from paper and tin foil. Soap, matches, fans and cotton are also manufactured. Hangchow was the capital of the Sung dynasty, 1127-1278; p. 1,000,000. Occupied by the Japanese, 1937.

**Hanging**, a method of executing capital punishment in Western Europe and America. In England it prevailed from the 13th century, and in the United States from the first execution in the colonies, its comparative humanity having caused it to replace other and more barbarous methods of enforcing the death penalty. In many of the States of the United States electrocution has been substituted for hanging. See CAPITAL PUNISHMENT.

**Hanging Gardens of Babylon**, anciently reckoned one of the seven wonders of the world, were situated within the great palace of Nebuchadnezzar in Babylon. They consisted of three and a half acres of gardens, groves, and avenues of trees, with fountains and banquetting rooms interspersed, and were raised, terrace-like, on tiers of masonry arches, to heights varying from 75 to 300 ft. above the plain. The ascent from terrace to terrace was made by marble stairs. The hanging gardens are generally ascribed to Nebuchadnezzar, who built them to please

his queen Amytis, a native of mountainous Persia.

**Hangö**, port of Finland, on the Gulf of Finland. The harbor is open throughout the year. Large quantities of butter are exported; p. about 5,500; leased to Russia.

**Hankow**, town and river port, China, in the province of Hu-peh, on the left bank of the Han, at its junction with the Yang-tse-kiang; Hankow is the center of the black-tea industry, and tea is its chief export. Hides, hemp, raw silk, and beans are also shipped; p. 778,000. Both on account of its intrinsic importance and its situation in relation to the chief routes, Hankow has figured prominently in the troubled history of modern China. During the Revolution of 1911 many desperate struggles between the Imperial and Revolutionary forces took place in Hankow. More recently, the capture of Hankow by the Nationalist armies advancing northward, 1926, marked the extension of Nationalist power to the middle Yangtze. It was followed by a serious mob onslaught on the British Concession. At length, an agreement was reached which provided for the dissolution of the British Municipal Council and the setting up of a Chinese municipality in its place; and in 1927, the British government sent a communication to the Chinese authorities, both at Peking and Hankow, containing proposals toward modifying the British position to conform to Nationalist aspirations. In 1937, Hankow became temporary capital of China, but it fell into Japanese hands, 1938, after removal of the capital to Chungking.

**Hanna, Marcus Alonzo** (1837-1904), American manufacturer and political leader, was born in New Lisbon, Ohio. He entered his father's wholesale grocery house in Cleveland, and continued until 1867, when he formed a partnership with his father-in-law. Hanna became president of the Union National Bank of Cleveland and of the Cleveland City Railway Co., and in 1885 was appointed by President Cleveland a director of the Union Pacific Railway Company. In 1880 he began his active political career as a Republican worker in Cleveland, and in 1896 was elected chairman of the Republican National Committee and became a political figure of national importance by reason of his part in the nomination and election of William McKinley. He publicly identified himself with the National Civic Federation shortly after its organization in 1900, and in 1901,

having been elected chairman of the executive committee, was largely influential in the settlement of the anthracite coal strike. Consult *Life* by Croly.

**Hannah**, the mother of the prophet Samuel. Her song is by many critics believed to date from a later time.

**Hannibal**, city, Missouri, Marion co. Industries include railroad repair shops, foundries, and manufactures of cement, lime, automobile tires, and truck bodies. The boyhood home of Mark Twain is maintained as a memorial; p. 20,865.

**Hannibal** (247-183 B.C.), Carthaginian general, and one of the greatest military geniuses of antiquity, was the son of Hamilcar Barca. When he left Carthage for Spain with his father in 238 B.C., the latter made him swear undying hostility to the Roman name; and he faithfully kept his oath. After his father's death he served in Spain under his brother-in-law, Hasdrubal; and when Hasdrubal was murdered, 221, Hannibal was called to the chief command. With about 90,000 infantry, 12,000 cavalry, and 37 elephants, he left New Carthage about the beginning of May, 218 B.C., and crossing the Pyrenees lost 20,000 men. The Roman general, Scipio, who had come to meet the invaders, was defeated in a skirmish near the river Ticinus, and soon afterwards near the Trebia. After a short rest, Hannibal crossed the Apennines and entrapped the Roman consul Flaminius into an ambush at the Trasimene Lake, inflicting upon him a crushing defeat, and then marched s. into Apulia, and into Campania. In the next year, 216, after wintering in Apulia, Hannibal gained a great victory at Cannæ. The reward of his victory was the accession of the Lucanians, Brutians, most of the Samnites, and Capua, where he wintered.

In 207 came the crisis of the war. Hannibal's brother Hasdrubal invaded Italy from Spain, but before he could join Hannibal he was decisively defeated; his army was practically annihilated, and he himself perished. For four years more Hannibal maintained his position in Bruttium; but finally the successes of the younger Scipio in Spain and his invasion of Africa called him home. He sailed from Croton in the autumn of 203 B.C., having for fifteen years held his own in Italy without a single serious defeat. But in 202 he fought the decisive battle at Zama in Africa against Scipio, and was utterly defeated, and at once urged his country to make peace.

During the next few years Hannibal la-

bored for the restoration of his country, reforming the government and reorganizing the finances. In 195 B.C., however, Rome demanded his surrender, and to avoid that he took refuge with Antiochus the Great of Syria, who in 192 B.C. engaged in war with Rome. The submission of Antiochus forced him to seek a new protector, and he fled to Prusias, king of Bithynia, with whom he lived, until the Romans sent Flaminius to demand his surrender. Thereupon Hannibal, seeing that escape was impossible, took poison, 183 B.C.

**Hanno the Great**, a Carthaginian leader who opposed Hamilcar and Hannibal and eventually became leader of the party favorable to Rome.

**Hanoi**, city, Annam, capital of the province of Tongking and of French Indo-China, on the right bank of the Red River. Since 1892 the old Annamese town has been replaced by a modern well built European town. Features of interest are the Botanical Gardens, the palace of the Governor General, the Temple of the Great Buddha, the Temple des Deux Dames, a 12th century building used as a convent, and the cathedral.

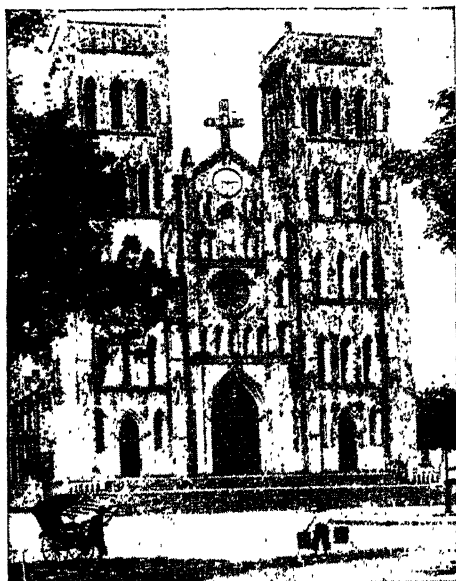
**Hanover**, province of Prussia, stretching from the Netherlands east to the Elbe, and from the North Sea s. to Hesse-Nassau. The soil is fertile; the greater part, however, is moorlands, large areas of which have been drained and reclaimed. Cattle are bred and grazed on the marshes. One-sixth of the area is covered with forest. Coal, iron, zinc, lead, copper, and salt are mined in the Harz Mountains. Ironware and steel goods, textiles, sugar, machinery, gutta-percha and india rubber, chemicals, scientific instruments, beer, and spirits are the more important products of the manufacturing industry. There is a university at Göttingen and a polytechnic school at Hanover; p. 3,211,205.

**Hanover**, city, Prussia, capital of the province of Prussia, on the banks of the Leine River. Among features of interest are the Royal Palace, a 17th century edifice rebuilt in 1817; the Altes Rathaus, erected in 1435; the Markt-Kirche, a Gothic structure of the 14th century, Leibnitz's House, now containing the industrial art museum; the Kestner Museum; the Provincial Museum, containing natural history and ethnographical collections; and Herrenhausen Castle, begun in 1665, with beautiful gardens modelled after those of Versailles. The Welf Castle, built in Romanesque style, in 1857-66, has been used as a technical academy since 1880. Indus-

tries include the manufacture of machinery, india rubber, iron, stationery, chemicals and textiles. The first mention of Hanover is in 1156. It joined the Hanseatic League in 1368. It is the birthplace of Sir William Herschel the astronomer; p. 473,000.

**Hanover**, village, New Hampshire, in Grafton co., near the Connecticut River. It is the seat of Dartmouth College; p. 3,043.

**Hanseatic League**, an association of North German trading towns, which in one form or another existed from the 12th to the 16th century. The Hanseatic League was a



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*Roman Catholic Cathedral in Hanoi, Indo-China.*

league of towns chiefly for the purpose of trade, though with this political objects were sometimes associated, as in Bergen and Wisby. The Baltic and the North Sea had early become important highways of commerce, and in the 13th century Wisby, on the island of Gothland, had grown into a flourishing town with a considerable eastern trade. Before the end of that century, however, Lübeck, Rostock, Wismar, Stralsund, and Greifswald had begun to play a more or less prominent part in the trade of the Baltic. On the North Sea, Bergen, London, and Bruges were the principal foreign markets frequented by German traders; in the first of these they monopolized the entire trade of Norway. In

the w., Cologne was the rival of Wisby; but her supremacy was early threatened by Lübeck, Hamburg, and Bremen.

In 1266 and 1267 Lübeck and Hamburg led in organizing German merchants in England into a single Hansa. But before the middle of the 14th century the Baltic and North Sea traders were united into one general league, the trading colonies of which extended from Novgorod the Great in Russia westwards to London. Although not a strict confederacy, the league soon began to acquire political power. In the 15th century the power and influence of the Hanseatic League began to decline and by the end of Henry VII.'s reign the English were making their rivalry felt in Norway as well as in the Baltic. The growth of territorialism in Germany, combined with foreign competition, and the geographical discoveries of the age, broke up the Hanseatic League, but Lübeck, Hamburg, Bremen, and a few others, have still retained the name of Hanse towns.

**Hansom Cab**, a light, two-wheeled covered carriage holding two passengers and having an elevated seat at the back for the driver. The wheels are large, and there are a strong high dashboard and two folding doors in front protecting the passengers from rain and dust. The vehicle much used in London in the 18th and 19th centuries was named for its inventor Joseph Hansom.

**Han-yang**, city, province of Hupeh, China, at the junction of the river Han with the Yang-tse-kiang, 600 m. from the sea, opposite Hankow and Wu-chang, with which it forms a great city known by the natives as Wuhan. It contains a famous temple. In the Revolution of 1911 it was captured by imperialists; p. 100,000.

**Haparanda**, the most northerly town of Sweden, Norbotten co., known for its meteorological station. Its harbor is at Salmis, on the Gulf of Bothnia, 7 m. distant; p. 1,500.

**Hapgood, Norman** (1868-1937), American journalist, born in Chicago. He was editor of *Collier's Weekly* (1903-12) and of *Harper's Weekly* (1913). He was United States Minister to Denmark from February to December, 1919. His published works include: *Literary Statesmen* (1897); *Daniel Webster* (1899); *Industry and Progress* (1911); *The Advancing Hour* (1920); *The Changing Years* (1930).

**Haplodon**, a genus of primitive rodents, including two species known as sewellels. The common sewellel, *H. rufus*, is found only on

the n.w. coast of North America. The California form, *H. major*, is larger.

**Hapsburg**, or **Habsburg**, an illustrious Austrian family, deriving its name from the castle of Hapsburg, built by the Bishop of Strassburg about 1021, on the banks of the Aar, in the Swiss canton of Aargau. The Bishop's nephew, Werner 1., was the first Count of Hapsburg, but the first distinguished member of the family was Albert III. Rudolf III., son of Albert IV., became emperor of Germany in 1273 and increased his possessions by seizing Austria, Styria, and Carinola, to which Carinthia and the Tyrol were added later. On the death of his son Albert, the imperial crown passed from the Hapsburgs, and for a hundred years following they were occupied in ruling their hereditary possessions. In 1438 Albert of Austria was elected emperor of the Holy Roman Empire, and for the first time Austria-Hungary and Bohemia were united under a Hapsburg ruler. From that time until 1806 all the emperors were Hapsburgs except Charles VII. and Francis I. Maximilian I. (1459-1519) inherited the Netherlands from his wife, Mary of Burgundy, and through the marriages of his grandchildren again brought the crowns of Hungary and Bohemia under Hapsburg control. His grandson, Charles V., was the founder of the Spanish line of Hapsburgs. He had as his share of the family possessions Naples, Sicily and Carcinia, to which he annexed (1535) the Duchy of Milan; Ferdinand, his brother, retained the Austrian possessions and became King of Bohemia (1526) and Hungary.

The Spanish line of Hapsburgs becoming extinct with the death of Charles II. of Spain in 1700, the crown was claimed by the Austrian branch of the family, but war ensued, and it passed to the Bourbons. The male line of the Austrian branch ended with the death of Charles VI. in 1740, but by the Pragmatic Sanction, the crown was secured to his daughter, Maria Theresa, who married Francis of Lorraine in 1745. After the dissolution of the Holy Roman Empire in 1806, the Hapsburgs continued to rule in Austria until the close of the Great War of Europe. Francis Joseph, who died in 1916, was succeeded by his nephew Charles, who abdicated Nov. 11, 1918. See AUSTRIA.

**Hara-Kiri** (incorrectly spelled **Hari-Kari**), a method of suicide by disembowelment, formerly practised in feudal Japan, chiefly among the Samurai, or military class.

**Harbin** or **Kharbin**, city of Manchukuo,

the new state established under Japanese auspices in 1932. Here the Manchurian Railway to Vladivostock bifurcates, a branch extending to Port Arthur and Peiping. It exports grains, furs and soy beans and contains railway shops, mills and factories; p. 332, 690.

**Harbor Grace**, town, on the w. side of Conception Bay, Newfoundland; 24 m. n.w. of St. John's. The harbor is large, but somewhat exposed. The town is the second largest in the island and of recent years it has become famous as the taking-off point for eastward trans-Atlantic flights; p. 4,279.

**Harboring** is the offence of receiving and concealing a person to whose custody another person or the state is entitled. One who knowingly harbors a criminal makes himself a participant (accessory after the fact) in the crime, and subjects himself to criminal liability as such. See ACCESSORY; HUSBAND AND WIFE.

**Hardanger Fiord**, inlet, 68 m. long, on the w. coast of Norway. The picturesque scenery of the fiord, with its numerous water-falls, attracts many summer tourists, and has been celebrated in verse by Wergeland and other native poets. The natives of the vicinity, called Harænger, still retain many interesting customs as well as a picturesque national dress.

**Harden, Maxmilian** (1861-1927), German journalist, was born in Berlin of Jewish parentage. In 1892 he founded the weekly journal *Die Zukunft*, which met with remarkable success. He was unsparing in his criticisms, was three times tried for *lèse majesté*, and spent a year in a Prussian fortress for that offence. His published works include *Apostata* (2 vols. 1892); *Kampfgenosse Sudermann* (1903); *Prozesse* (1913); *Krieg und Frieden* (1918); and studies of his contemporaries which appeared in English under the title of *I Meet My Contemporaries* (1925).

**Hardenbergh, Henry Janeway** (1849-1918), American architect, was born in New Brunswick, N. J. Among the buildings erected according to his designs are the Waldorf-Astoria Hotel, Manhattan Hotel, Plaza Hotel, and American Fine Arts Society Building, in New York City.

**Hardicanute** (c. 1019-42), king of England, son of Canute and Emma of Normandy. He was under-king in Denmark at the time of his father's death (1035), and the Witan gave the crown to his half-brother Harold, reserving Wessex for Hardicanute.

The West Saxons deposed him in 1037 for tarrying in Denmark, and he made preparations for invading England when Harold died (1040). The Witan then offered Hardicanute the crown.

**Hardie, James Keir** (1856-1915), British labor leader, was born in Scotland. He was chairman, and the life and soul, of the Independent Labor Party till 1900. In 1907 he made an extended visit to India and Australia. He visited America in 1895, 1908, 1909 and 1912. He was proprietor and editor of the *Labor Leader* and wrote several books, including *After Twenty Years*; *All About the Independent Labor Party*.

**Harding, or St. Stephen** (c. 1060-1134), Cistercian abbot and ecclesiastical reformer, was born in Sherborne, Dorsetshire. He helped to found the monastery of Cîteaux, as well as several others, among them that of Clairvaux. Being appointed abbot of the former (1110), he nearly destroyed the community by his rigor. St. Bernard and thirty companions joined him in 1113, and moderated his asceticism. Harding wrote *Charter of Charity*, the constitution of the Cistercian order. See CISTERCIANS.

**Harding, Warren Gamaliel** (1865-1923), twenty-ninth President of the United States, was born in Corsica, Ohio, on Nov. 2, 1865, the eldest of a family of eight. In 1883 his father purchased the *Marion Star*, a small daily, and in 1884 the ownership was transferred to the son. This paper Harding continued to control until within a few months of his death. Harding early aligned himself with the Republican Party. His political career began with his election to the State Senate in 1898. He was re-elected to the Senate in 1901, and in 1903 became Lieutenant-governor of Ohio, with Myron T. Herrick as Governor. In 1910 he was selected by the Republicans as candidate for Governor but was defeated by Judson Harmon. Two years later, with his election as U. S. Senator, he entered the field of national politics. He became a member of the Foreign Relations Committee, but was little known nationally, when he was chosen as chairman of the Republican Convention of 1916. At the Convention of 1920 he was nominated for president on the tenth ballot, receiving 692½ votes, the other leading candidates being Gen. Leonard Wood, with 156 votes; Governor Lowden, 80½; Hiram Johnson, of California, 80½. As a result of the following campaign Harding was elected President of the United States, showing a popular ma-

jority over Governor James Cox, the Democratic candidate, of 7,000,000 and a majority in the electoral college of 177. He assumed office on March 4, 1921.

The first outstanding accomplishment of the Harding administration was the Conference for the Limitation of Armament held in Washington, Nov. 12, 1921-Feb. 6, 1922. Representatives of nine nations participated, and definite agreements were reached for the limitation of naval armaments and the adjustment of Pacific problems. Negotiations were entered into with Germany and Austria, with whom the United States was still technically in a state of war, and treaties were concluded re-establishing peace. A settlement was reached with Great Britain for the discharge of her war debt to the U. S. The ratification of the Colombian Treaty (1921) settled a long-standing grievance arising out of the recognition of Panama by the U. S. government in 1903 (see COLOMBIA).

In domestic affairs the notable achievements of the administration were the revision of the tariff (see TARIFF), and of the tax laws (see TAXATION); the passage of an act for the restriction of immigration (see IMMIGRATION); the establishment of a responsible budget system, which had been under discussion for the past ten years (see BUDGET); and the extension of the program of aid for wounded, sick, and disabled war veterans. The soldiers' bonus bill was vetoed. One of the most vexed questions of the Harding administration was the American attitude toward international politics. Harding's attitude as president was defined in his support of the Permanent Court of International Justice and his plea for American adherence to such a court.

On June 20, 1923, President Harding left Washington for a 39 days' tour of the Western States and Alaska and was the first American President to cross the Canadian boundary line during his term of office. On July 27 he made his last public speech, at Seattle, dealing with the Alaskan problem. The following day he was taken ill; and on August 2 died from a stroke of cerebral apoplexy.

**Harding, William P. Gould** (1864-1930), American banker and public official, was born in Greene co., Alabama. In 1914 he became a member of the Federal Reserve Board at Washington, of which he was made governor in 1916. He became managing director of the War Finance Corporation in 1918 and in 1922 advised the Cuban govern-



ment as to the reorganization of its finances, a service he later performed for Hungary and Poland. He wrote *The Formative Period of the Federal Reserve System* (1925).

**Hard Labor.** Persons convicted of crime in those States where the penitentiary system has been adopted, may be sentenced, as a part of their punishment, to perform hard labor. See IMPRISONMENT.

**Hardness of Water.** Compounds of calcium, or less commonly magnesium, when present in natural water, make it hard—i.e., they form insoluble compounds with soap, and prevent its lathering. Hardness due to the presence of the bicarbonates of the above metals disappears on boiling, and is, therefore, said to be temporary; but that due to the sulphates and chlorides is not removed by boiling, and is called permanent hardness.

**Hardness, Scale of,** in mineralogy, is the degree of resistance which a smooth surface offers to abrasion, and is determined by the way in which that surface is scratched by a substance of definite comparative hardness. The series of minerals selected by Mohs to form a standard scale for comparative purposes is as follows: talc; gypsum; calcite; fluorspar; apatite; orthoclase; quartz; topaz; sapphire; diamond. In this scale each member will scratch all those which have lower numbers, and will be scratched only by those which have higher. More refined methods of testing are necessary to elicit these differences, and the 'sclerometer,' an instrument in which a small point of steel or of diamond is drawn across the surface under a definite pressure, may be used for this purpose.

**Hardwar,** ancient town in Saharanpur district, United Provinces, India, on the right bank of the Ganges, at the mouth of the gorge through which it issues from the Himalayas. Its position on the sacred stream makes it a popular spot for ablution, and its bathing ghat and temple of Gangadwara are annually visited by between 200,000 and 300,000 pilgrims; p. 28,000.

**Hardware,** a term used to include a great variety of articles manufactured out of metal including carpenter's, housekeeper's, or builder's hardware. American hardware manufacture began about the middle of the 19th century and has developed rapidly. Connecticut is the leading State in the value of its hardware manufactures, with Illinois second.

**Hardy, Arthur Sherburne** (1847-1930), American novelist and diplomat, was born in Andover, Mass. He was editor of *The Cos-*

*mopolitan* in 1893-5, after which he served as U. S. minister and consul at Teheran, Persia (1897-9); envoy to Greece, Roumania, and Serbia (1899-1901); minister to Switzerland (1901-3), and minister to Spain (1903-5). He is the author of several mathematical works, and of *But Yet a Woman* (1883); *Wind of Destiny* (1886); *No. 13, Rue du Bon Diable* (1917); *Things Remembered* (1923).

**Hardy, Thomas** (1840-1928), English novelist and poet, was born near Dorchester. In 1865 he began his first literary work, and for a time divided his attention between that and architecture, but on the publication of his first important novel, *Far from the Madding Crowd*, in 1874, he finally abandoned architecture, and settled in Dorsetshire. A long series of novels, full of local color and local character, has made Wessex familiar to his hosts of readers. Two or three of his stories have been dramatized and presented on the stage notably, *Tess of the D'Urbervilles*, which was successfully played by Mrs. Minnie Maddern Fiske. After 1909 he devoted himself almost entirely to poetry. He was a powerfully realistic writer, a keen student of human nature, and is considered by many as the foremost among recent English novelists. His works include the novels *Under the Greenwood Tree* (1872); *A Pair of Blue Eyes* (1873); *Far from the Madding Crowd* (1874); *The Return of the Native* (1878); *The Trumpet-Major* (1880); *The Mayor of Casterbridge* (1886); *The Woodlanders* (1887); *Wessex Tales* (1888); *A Group of Noble Dames* (1891); *Tess of the D'Urbervilles* (1891); *Life's Little Ironies* (1894); *Jude the Obscure* (1895); *The Well-Beloved* (1897); and the poems *Wessex Poems* (1898); *Poems of the Past and the Present* (1901); *The Dynasts* (1904); *Time's Laughing Stock and Other Verses* (1909); *Lyrics and Reveries* (1914); *Selected Poems* (1916); *Late Lyrics* (1922); *Human Shows* (1925); *Winter Words in Various Moods and Metres* and *Old Mrs. Churdle* were published in 1928. Also *The Life and Letters of Thomas Edward Hardy* by his widow.

**Hardy, Sir Thomas Masterman** (1769-1839), English vice-admiral, was born in Somersetshire. He was present at the battle of the Nile (1798), was flag-captain to Nelson (1798-9), was with him at the battle of Copenhagen in 1801, and was his constant companion until Nelson's death in his arms, at Trafalgar (1805). He played an important part in the war of 1812-15 with America.

**Hare**, a name applied generally to all the members of the rodent family Leporidae, except the European, or true, rabbit. American hares include the common 'cotton-tail' or 'rabbit' (*Lepus floridanus*), the southern marsh hare (*L. palustris*), the widely distributed varying hare (*L. americanus*), which in the northern part of its range becomes white in the winter, resuming a brown dress with the spring molt; the polar hare (*L. arcticus*), white at all seasons; and the various large, long-eared 'jack-rabbits' (of which the best known is *L. campestris*, whose home is on the plains. For the distinctions between the hare and rabbit, see RABBIT.

**Hare, Augustus John Cuthbert** (1834-1903), English author, was born in Rome. He devoted himself particularly to the historical and artistic antiquities of the cities of Italy. His writings include *Memorials of a Quiet Life* (1872-76); *Cities of Northern Italy* (1884); *North-Western France* (1895); *Biographical Sketches* (1895); *Story of My Life* (6 vols. 1896-1900).

**Hare, John** (1844-1921), English actor, was born in London. His tenancy of the Garrick Theatre (1889-95) was remarkable, among other things, for a fine production of *La Tosca*, and perhaps the most popular of his impersonations, Benjamin Goldfinch in *A Pair of Spectacles*. In 1896-7 he visited America, and again in 1900 with *The Gay Lord Quesx*.

**Hare and Hounds**, a game popular at Rugby and since 1877 developed in England into an organized sport, with a recognized code of rules and many clubs for cross-country running. It is occasionally played in the United States, where in a few schools and athletic organizations it is a favorite sport. The exercise usually takes the form of a paper-chase where the 'hares' distribute bits of paper along their course. This the 'hounds' must follow after giving the hares a suitable time to get well under way.

**Harebell**, or **Bluebell**, the popular name of the beautiful, slender-stemmed *Campanula rotundifolia*, whose solitary little drooping pale blue flowers are borne on the finest and most graceful of flower-stalks.

**Hareld**, or **Long-tailed Duck** (*Harelda hyemalis*), an Arctic bird, characterized by the great elongation of the tail feathers in the male. Its habitat is the far north of both hemispheres; but it comes s. as a winter visitor.

**Harelip**, a congenital deformity, due to

a developmental deficiency, which results in a vertical cleft of the upper lip, on one or both sides of the middle line. It is often accompanied by cleft palate.

**Harem**, the name given in Turkey, Egypt, Syria, and other countries to that secluded part of a Mohammedan dwelling which is reserved exclusively for the female members of the household. The word is also used to signify those who live in the harem. As an institution the harem existed among the ancient Babylonians and Persians, and seems to have appeared in one form or another among all those races which, while practising polygamy, have arrived at any considerable degree of civilization. It has attained its greatest development, however, among Mohammedan races. Of late years the growing feminist and nationalist movements in Turkey and other countries have resulted in greater freedom for women and changed social conventions.

**Hares**, North American aborigines, one of the main branches of the Athapascans, or Chippewayans, who are scattered in small groups along the banks of the Mackenzie, Anderson, and Macfarlane rivers, between the Great Bear Lake and the Eskimo domain. They are employed as trappers and voyageurs or assistants about the stations of the Hudson's Bay Company.

**Harfleur**, former harbor, France, in the department of Seine-Inférieure, on an estuary of the Seine, 5 m. s.e. of Le Havre, which supplanted it as a harbor when the river became silted. During the Hundred Years' War Harfleur was the chief harbor on the French coast of the Channel; p. 3, 120.

**Hargraves, Edmund Hammond** (1816-91), British discoverer of the Australian gold fields, was born in Gosport, Hampshire. He became an Australian sheep-farmer, and on Feb. 12, 1851 discovered gold at Lewis Ponds Creek in the Blue Mountains, New South Wales. He was appointed commissioner for gold fields and was subsequently pensioned.

**Hargreaves, James** (d. 1778), British artisan, the inventor of the spinning jenny, was a hand-loom weaver near Blackburn. About 1764 he invented the spinning jenny, by which spinners were enabled to do eight times as much as had formerly been done. For thus upsetting old methods he was mobbed by his fellow-workmen (1768), and two years later he removed to Nottingham, where he took out a patent.

**Haricot**, the name commonly applied to

the dried seeds of the French bean or kidney bean which are extensively eaten in France. See BEAN.

**Hariri, Abu Mohammed al Kasim ibn Ali, Al-** (1054-1121), Arabic author surnamed Al-Hariri ('the silk merchant'), was born in Basrah, on the Shat-el-Arab. The most famous of his compositions was *Makamat*, a collection of tales in rhyme, which are unrivalled in Arabic literature for brilliancy of imagination and wit. This book is regarded in the East as second only to the Koran.

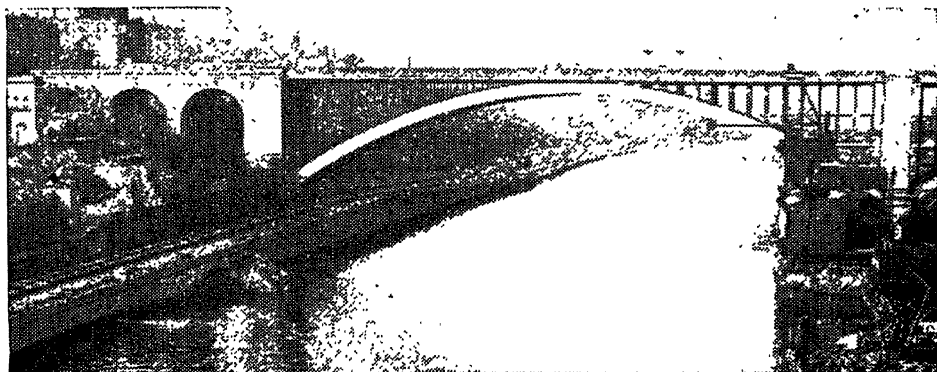
**Harkness, Edward Stephen** (1874-1940), American banker and philanthropist born at Cleveland, Ohio. He is trustee of the Metropolitan Museum of Art and the Presbyterian Hospital of New York City,

**Harland, Marion.** See Terhune.

**Harlech**, town, Merionethshire, Wales. Its 14th-century castle held out against the Yorkists, but in 1468 was forced to surrender. This siege is said to have given rise to the Welsh national air, *Men of Harlech*.

**Harleian Manuscripts**, a collection made by Robert Harley, Earl of Oxford, and by Edward, his son. It consists of 8,000 MSS., 50,000 printed books, and 400,000 pamphlets. The collection is rich in illuminated MSS. relating to civil and religious history, copies of the classics—containing the earliest known copy of the *Odyssey*—and of early English poetry. A large part of the collection is now in the British Museum.

**Harlem**, formerly a village, now part of



Harlem River Bridge, New York.

and director of several railroads, but is particularly known as a benefactor of educational and charitable institutions both here and abroad. Among his notable gifts are the dormitories at Yale and Harvard and contributions to the New York City Emergency Employment Commission and the United Hospital Fund.

**Harlan, John Marshall** (1833-1911), American jurist, was born in Boyle co., Kentucky. He was a candidate for the Vice-Presidential nomination (1872). In 1877 he became an Associate Justice of the U. S. Supreme Court; in 1889, professor of law in George Washington University. He was a member of the Bering Sea Tribunal of Arbitration in 1893.

**Harland, Henry** (1861-1905), American novelist, was born in St. Petersburg, Russia. His works include *The Land of Love* (1887); *The Cardinal's Snuffbox* (1900); *The Lady Paramount* (1902); *My Friend Prospero* (1904).

New York City. See NEW YORK CITY. It is a local name for the district located between the Harlem and East Rivers above 106th Street, and has a large negro population.

**Harlem River**, together with Spuyten Duyvil Creek, separates Manhattan Island (New York City) from the mainland to the e. and n. It is navigable and with a short ship canal provides a waterway between the Hudson and East Rivers. High, Washington, and other bridges cross it. See NEW YORK CITY.

**Harlequin**, a survival from Greek and Roman comedy. The mediæval Italian *arlecchino* was equivalent to the English clown. The business of Harlequin is to protect Columbine against the intrigues of Pantaloon and Clown.

**Harlequin Duck** (*Histrionicus histrionicus*), a handsome species, which inhabits Northern Europe and Canada, and comes s. in winter as far as the Middle States of the United States.

**Harlingen**, the chief commercial seaport of the province of Friesland, Netherlands, on the Zuider Zee. It has an excellent harbor, built in 1870-7, and exports butter and cheese, cattle and sheep, fish, potatoes, and other produce; p. (1910) 10,209.

**Harmon, Judson** (1846-1927). American jurist. He was Attorney-General in President Cleveland's Cabinet (1895-7). He was made professor of law in the University of Cincinnati in 1896. He was elected Democratic governor of Ohio in 1908. At the Baltimore convention in 1912 he was a prominent rival of Woodrow Wilson for the presidential nomination.

**Harmonica**, a musical instrument perfected by Benjamin Franklin, in which sounds are produced by the percussion or friction of the moistened fingers on cups or tubes of glass or metal. Now chiefly used as a toy, the instrument, in various forms, was formerly of artistic importance. The modern harmonica is a reed mouth organ, played by the breath and lips. In recent years the instrument has become very popular. In 1921 Albert N. Hoxie organized the first harmonica band. Since then harmonica bands have sprung up all over the world, the most famous being that of Borrah Minevitch which has played in the principal cities of America and Europe. In 1936 Minevitch and his band gave concerts of classical music in London.

**Harmonic Motion**, the general name given to a reciprocating motion like that of a piston or a pendulum. Simple harmonic motion is defined geometrically as the projection of uniform circular motion on a diameter. It is the basis of the theory of vibrations and of wave motion. Periodic oscillations, such as the vibrations of a string in producing a musical note, can be analyzed and investigated by the laws of harmonic motion.

**Harmonic Progression**. See **Series**.

**Harmonium**, a modern keyboard musical instrument, patented in 1840. The cabinet organ which closely resembled the harmonium soon supplanted it throughout the United States. Its chief points of difference consist in having the action of the bellows reversed, so that the wind is sucked through the reeds; and in having the tongues smaller, and twisted or curved, and less in proportion to their apertures than in the harmonium.

**Harmony**, in music. This important branch of the art consists of uniting related musical sounds in conjunctive groups, termed *chords*, the formation and manner of pro-

gression of which are governed by more or less fixed laws. There is no evidence that any form of harmony other than that of the drone bass was in use before the 10th century when the addition of a single part to a canto fermo is first described; fourths, fifths, and octaves were the combinations most frequently employed. About a century later this method was succeeded by a form termed *dis-cantus*, in which two distinct melodies were so arranged that, when sung together, they produced tolerable two-part harmony. As time went on other combinations and devices were introduced, and harmony was studied systematically; chords were classified, and rules for their progression formulated.

About the close of the 14th century, discords, passing notes, suspensions, accidentals, inversions, and chromatic passages were in use; four-part writing had been introduced, and descant had changed to counter-point, under which name it soon became a highly intricate form of musical composition. Monteverde in 1600 introduced the use of unprepared dominant sevenths and other discords. This new feature, while greatly augmenting the dramatic resources of the musician, also paved the way for subsequent discoveries, which eventually placed the study of harmony upon an entirely new basis. The principles of key and chord relationship were gradually analyzed and understood.

At a somewhat later period the introduction of temperament, by means of which all keys are made theoretically equal, gave unlimited scope to modulation, and made possible the valuable device of enharmonic changes. In the beginning of the 18th century J. S. Bach, by uniting the old systems and the new, may be said to have set the chief cornerstone in the structure of modern harmony. Since the rise of modernism in music dating from Wagner, the most startling changes have recently occurred under the impetus of Stravinsky, Scriabin and Schönberg. Scriabin's chord experiments are especially noteworthy. Schönberg's changes in traditional harmony were even more radical, notably his 'twelve tone system' employing a chord based on the twelve tones of the chromatic scale.

In line with the attempt to evolve new subtleties and nuances of tonality the quarter-tone music of Alois Haba becomes outstanding.

In jazz new changes were introduced in 1936 and 1937 which may have far-reaching importance. This is known as 'swing

music.' Bibliography: *Composers of Today*, by David Ewen (1936).

**Harmsworth, Alfred Charles.** See Northcliffe, Baron.

**Harnack, Adolf** (1851-1930), German church historian. He was general director of the Royal Library, Berlin and was one of the greatest writers on theology and allied subjects.

**Harned, Virginia** (1868), American actress, made her New York *début* in 1890. She later appeared with success as Trilby, Ophelia, Alice Rousillon in *Alice of Old Vincennes*, and Iris.

**Harold I.** (d. 1040), surnamed HAREFOOT, king of England. On the death of Canute in 1035, the witan bestowed upon Harold all the provinces n. of the Thames. In 1037 Wessex also submitted to Harold.

**Harold II.** (?1022-1066), king of the English, second son of Earl Godwin, shared in his father's banishment (1051) and restoration, and on Godwin's death (1053) became earl of Wessex. In 1066 he was nominated by the English King as his successor, and on the King's death was elected by the nobles. Thereupon William of Normandy invaded England. Harold, first defeating Harold of Norway and his own brother Tostig at Stamford Bridge in Yorkshire, marched against William, and at the Battle of Hastings was overthrown and slain.

**Harold, or Harald,** four kings of Norway, of whom two call for special notice. **HAROLD I.** (king, 863-933, son of Halfdan the Black, united Norway into one kingdom. By his victory at Hafsljorð (872) he destroyed the provincial autonomy of Norway, but in his last years he divided the realm among his sons (930).—**HAROLD III., Hardraade** ('Hard in Counsel'), half brother of St. Olaf. After the defeat of the latter at Stikklestad (1030) by the heathen party, Harold took refuge in Novgorod, and then for some years was captain of the Varangian Guards at Byzantium, winning many brilliant victories over the Saracens in Italy and Sicily. He returned about 1045 to Norway, and after the death of his nephew Magnus the Good (1047) succeeded to the crown of the whole kingdom. His attempt to subdue Denmark failed, and he fell fighting against Harold II. of England at Stamford Bridge (1066).

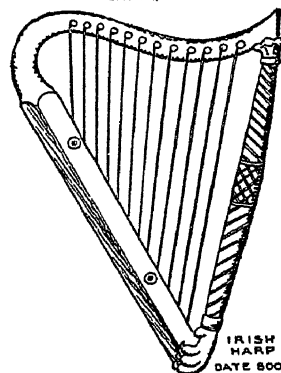
**Haroun al-Raschid, or Harun ar-Raschid** (763 or 766-809), 5th of the Abasid califs of Bagdad. To the Western mind he figures chiefly as the hero of the *Arabian Nights* (see ARABIAN NIGHTS ENTERTAIN-

MENTS). In reality, however, Haroun was ruthless and revengeful; for out of sheer jealousy he murdered Jaafar the Barmecide and all his family (see BARMECIDES). He waged successful war against the Byzantine Empress Irene and her successor Nicephorus. His empire extended from North Africa (Tunis) to Transoxiana.

**Harp,** a musical stringed instrument of ancient origin, played by sounding the strings with the fingers. It is roughly triangular in



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Harps.

shape, consisting of an upright symmetrical pillar and a slanting sound-board rising from a common pedestal, with a gracefully curved neck uniting the two; the strings pass from the neck to the sound-board. The modern concert harp is from 66½ to 72 inches in height, and has from 43 to 48 strings tuned to the diatonic notes of the C-flat scale, possessing a compass of six and a half oc-

taves. Seven pedals in the pedestal, connected with a series of rods in the upright pillar, control a mechanism whereby the strings may be shortened, thus altering their pitch and changing the key of the entire scale of the instrument.

The harp is probably Egyptian in origin. The instrument was not in use among the ancient Romans, but is said to have been introduced into Ireland by the Phœnicians some centuries before Christ. The mediæval harp was a simple instrument tuned to the diatonic scale of the music to be performed, while the strings were altered to suit any modulations out of the key by pressure of the finger or by the use of metal crooks. The modern Irish harp, a much improved model of the old Irish harp, was patented by Melville A. Clark, an American, in 1911. It is made in two sizes, 25 and 39 inches, with 26 and 31 strings respectively, spaced in the same manner as the strings of the concert harp.

**Harper, William Rainey** (1856-1906), American scholar, born at New Concord, Ohio. He was professor of Semitic languages at Yale (1886-91); Woolsey professor of Biblical literature at Yale (1889-91); and from 1891 president of the University of Chicago, where he introduced various educational innovations and showed marked executive ability. He founded and edited the *Biblical World* and the *American Journal of Semitics*.

**Harper and Brothers**, New York printing and publishing firm, started in 1817 as J. and J. Harper by two brothers, James (1795-1869) and John (1797-1875), sons of Joseph Harper, farmer, of Newtown, Long Island. In 1825 two other brothers, Joseph Wesley (1801-70) and Fletcher (1806-77), were admitted to partnership. The firm issued about two hundred works before changing the name in 1833 to Harper and Brothers. The firm issued *Harper's Magazine* (founded 1850), *Harper's Weekly* (1857), and *Harper's Bazar* (of fashions, 1867). In 1901 as a result of financial embarrassment the corporation was thoroughly reorganized under the presidency of Col. George Harvey. It still publishes *Harper's Magazine* and books. See J. H. Harper's, *The House of Harper* (1912).

**Harper's Ferry**, vil., Jefferson co., W. Virginia, on the Potomac R., at its union with the Shenandoah. On Oct. 16, 1859, John Brown, the Abolitionist, raided the armory, but was overpowered and captured

the next day by United States troops under Colonel R. E. Lee. (See BROWN, JOHN.) During Lee's invasion of Maryland in 1862, the Federal garrison under Col. Miles was surrounded by a large Confederate force under 'Stonewall' Jackson and after a resistance of two days surrendered; p. 665.

**Harpignies, Henri Joseph** (1819-1916), French landscape painter, born at Valenciennes. His first important work was *Lisi re de Bois sur les Bords de l'Allier*, in which the influence of Corot is apparent. *Le Saut de Loup* (1873), in the Luxembourg, Paris, is generally considered his masterpiece; there are also two other good pictures, *Evening* (1866) and *Rising of the Moon* (1884)—the latter in the Metropolitan Museum in New York.

**Harpoon**, a weapon used in capturing whales and large fish. The harpoon now most commonly used is the 'toggle-iron'; it consists of a pointed shaft, in which is fastened, near the end, a pivoted crosspiece. On the rope being pulled, after the shaft has penetrated the fibrous tissue beneath the blubber of the whale, the crosspiece sets at right angles, and so prevents the shaft from being withdrawn. The harpoon-gun is a gun from which a harpoon or toggle-iron, with line attached, can be fired.

**Harp-shell** (*Harpa*), a genus of tropical gasteropod molluscs. The shell is marked by prominent ribs arranged at regular intervals, and rich red and brown mottlings.

**Harpsichord**, one of the prototypes of the modern grand piano, which latter retains the external appearance of the earlier instrument. Instead of the hammer action of the piano, the harpsichord had its tones produced by the action of points of quill, or of hardened leather, called 'jacks,' which plucked or twitched the strings when the keys were depressed. (See CLAVICHORD, PIANOFORTE, SPINET.) Until the latter part of the 18th century, when it was superseded by the piano, the harpsichord was not only a favorite solo instrument, but held an important position in the orchestra, being used by the conductor to lead his forces. See Bie's *History of the Pianoforte* (trans. by Kellett and Naylor, 1899).

**Harpy**, or **Harpy Eagle** (*Thrasaëtus harpyia*), a bird of prey, of the family Falconidæ, which inhabits Central and S. America from southern Mexico to Paraguay and Bolivia. The bird, which is the king eagle of the Spaniards, is the most powerful of the American birds of prey. The harpies of

Greek folklore were probably fruit-bats. See **HARPY**.

**Harpy**, a foul, predatory bird, in Greek mythology. They were originally personifications of the swift storm winds.

**Harriman, Edward Henry** (1848-1909), American railroad magnate and financier, was born in Hempstead, L. I. In 1872 he founded the firm of Harriman & Co., bankers and brokers; in 1883 he became a director of the Illinois Central Railroad, and in 1887 its vice-president. He was a member of the syndicate which, after the Union Pacific Railroad went into receivership (1893), bought the system for about \$62,000,000. He was made chairman of the executive committee of the new company in 1898, and by acquiring the Oregon Short Line, the Oregon Railway and Navigation Company, and the Central and Southern Pacific Railroads, in a few years obtained a clear path from Chicago to the Pacific. His unsuccessful struggle with J. J. Hill and his associates to gain control of the Northern Pacific caused the Wall Street panic of May, 1901. At the time of his death he was master of 25,000 m. of railroad and had a controlling voice in the management of 50,000 more miles, and in 54,000 m. of sea routes.

**Harrington, Mark Walrod** (1848-1926), American scientist, was born in Sycamore, Ill. From 1879 to 1891 he was professor of astronomy, and director of the observatory at the University of Michigan, and in the latter year was appointed chief of the U. S. Weather Bureau. From 1895 to 1897 he was president of Washington State University. He founded and for a time edited the *American Meteorological Journal*.

**Harris, Frank** (1856-1931), English author and editor, was born in Galway, Ireland. He became editor successively of *The Evening News*, *The Pictorial World*, *The Fortnightly Review*, and *The Saturday Review*. In 1907 he visited the United States and in 1908 published *The Bomb*, a remarkable story of the Haymarket Square Riots in Chicago (1885-6). In 1916, having again returned to America, he became editor of *Pearson's Magazine*. His other works include *The Man Shakespeare* (1909); *Contemporary Portraits*, 4 series (1915-1923).

**Harris, George** (1844-1922), American educator, was born in East Machias, Me. He was professor of Christian theology at Andover Theological Seminary from 1883 to 1889, when he became president of Amherst College, an office which he held until 1912.

**Harris, Isham Green** (1818-1897), American legislator, was born near Tullahoma, Tenn. In 1857 he was elected governor of Tennessee, and was re-elected in 1859 and 1861. By the authority of the legislature he entered Tennessee in the military league of the Confederate States. He was elected U. S. senator to fill a vacancy in 1877, and was re-elected for three successive terms. In the Senate he became known as a brilliant and powerful debater.

**Harris, Joel Chandler** (1848-1908), American author, was born in Eatonton, Ga. He is best known for his now classic *Uncle Remus stories*, four series of which appeared between 1880 and 1905; in them, as in other stories, he has entertainingly presented in negro dialect a vast fund of negro folklore. Among his other books are *Mingo* (1884); *Free Joe* (1887); *Little Mr. Thimblefinger* (1894); *Mr. Rabbit at Home* (1895); *Plantation Pageants* (1899); *On the Wings of Occasions* (1900); *The Tar Baby and Other Rhymes* (1904); *Told by Uncle Remus* (1905). In more serious vein he wrote a memoir of *H. W. Grady* (1890) and *Georgia from the Invasion of De Soto to Recent Times* (1899).

**Harris, Townsend** (1804-78), American diplomat, was born at Sandy Hill, N. Y. He was the first American consul-general to Japan (1855), and in 1857 drew up a treaty between the United States and Japan, the first agreement of the kind to be entered into by Japan, and the model for subsequent treaties with other foreign powers. Before going to Japan, Mr. Harris was president of the New York Board of Education and also one of the founders of the New York Free Academy, now the College of the City of New York. Consult Griffis' *First American Envoy to Japan* (1895).

**Harris, William Laurel** (1870-1924), an American mural painter, was born in New York City. He assisted in the decorations for the Congressional Library in Washington and for St. Bartholomew's Church, New York, but his most important work is in the Church of the Paulist Fathers (New York).

**Harris, William Torrey** (1835-1909), American educator, was born in North Killingly, Conn. He was prominent in the introduction of the kindergarten, and of nature-study courses into the public school system, was identified with the Concord School of Philosophy, and stimulated metaphysical study in America. He established the *Journal of Speculative Philosophy* in

1867, edited *Webster's New International Dictionary* (1909), and served as United States Commissioner of Education, 1889-1906.

**Harrisburg**, city, Pennsylvania, capital of the State, and county seat of Dauphin co., on the Susquehanna River. Harrisburg has a number of imposing public buildings, most conspicuous among them being the State capitol, which was built to replace the old capitol burned in 1897. In the surrounding region are extensive coal and iron mines, and this fact, together with the convenience of transportation both by river and by rail, has contributed greatly to the city's industrial importance. It is also a jobbing center in the lumber trade. The chief industries are those concerned in the production of iron and steel. The first settlement here was made by John Harris (1726). A village grew up which was first named Harrisburg, then Louisburg, in honor of Louis xvi., and which in 1791 was incorporated as Harrisburg. It became the capital of the State in 1812. In 1860 it was incorporated as a city; p. 83,878.

**Harrison, Benjamin** (c. 1740-91), American patriot, one of the signers of the Declaration of Independence, was born in Berkeley, Va. From 1774 to 1777 he was a delegate to the first Continental Congress. As chairman of the committee of the whole house he presided over the debates upon the Declaration of Independence and reported the document as having been approved July 4, 1776. He was subsequently speaker of the house of Burgesses of Virginia (1777-82) and governor of the State (1782-4), and a member of the convention that ratified the Federal Constitution (1788).

**Harrison, Benjamin** (1833-1901), 23d president of the United States, was born in North Bend, Ohio, on Aug. 20, 1833. He was the grandson of William Henry Harrison, and the great grandson of Benjamin Harrison, one of the signers of the Declaration of Independence. He practised law with great success at Indianapolis, Ind., and in 1860 was elected reporter of the Supreme Court of Indiana. During the Civil War he served with distinction in the Federal Army. He rendered conspicuous services under General Sherman during that officer's Atlanta campaign in 1864, commanding a brigade at Kenesaw Mountain and Peach Tree Creek, and later commanded a reserve brigade in the battle of Nashville.

In 1876 Harrison was Republican candi-

date for the governorship of Indiana, but was defeated. From 1881 to 1887 he was a prominent member of the United States Senate. In 1888, as the Republican candidate, he defeated Cleveland for the presidency, and in 1892 was in turn defeated by Cleveland.

Harrison's administration (1889-93) was marked by the amicable settlement, by arbitration, of the Bering Sea dispute with Great Britain, by the holding of the Pan-American Congress of 1889-90 in Washington, by the passage of the McKinley Tariff Bill and the Sherman Silver Bill of 1890, by the admission into the Union of the States of Montana, Washington, North and South Dakota, Wyoming, and Idaho, by a diplomatic difficulty with Chile growing out of the attack of a mob in Valparaiso on sailors of the U. S. cruiser *Baltimore*, and one with Italy growing out of the killing of Italians by a mob in New Orleans, and by the suppression of the Louisiana lottery.

After the close of his term Harrison resumed his law practice, and in 1899 was the chief counsel of Venezuela before the arbitration tribunal at Paris, assembled to settle the boundary dispute between that government and Great Britain. He died at Indianapolis March 13, 1901, and is buried in North Bend, Ohio. He wrote *This Country of Ours* (1897) and *Views of the Ex-President* (1901). Consult *Life* by Lew Wallace, and Wilson's *Presidents of the United States*.

**Harrison, George Leslie** (1887- ), banker, became legal secretary to the late Justice Oliver Wendell Holmes soon after being graduated from Yale and the Harvard Law School. He was appointed general counsel of the Federal Reserve Board in 1919 and was successively deputy governor and governor of the New York Federal Reserve Bank.

**Harrison, Richard Berry** (1864-1935), American negro actor who played the character of 'De Lawd' in Marc Connelly's *The Green Pastures* in 1,657 performances.

**Harrison, (Thomas) Alexander** (1853-1930), American genre and landscape painter, was born in Philadelphia, Pa. His marine views are especially noteworthy. One of his best known works is *Castles in Spain*, in the Metropolitan Museum of Art, New York City.

**Harrison, William Henry** (1773-1841), ninth president of the United States, was born at Berkeley, Charles City co., Virginia, Feb. 9, 1773. He was the son of Benjamin Harrison, a signer of the Declaration of Independ-



ence. From 1801 to 1813 he was governor of Indiana Territory and also United States Indian commissioner. He defeated the Indians in the famous battle of Tippecanoe (Nov. 7, 1811) and during the War of 1812, first as brigadier-general and then as major-general, was in command of the United States troops in the Northwest, distinguishing himself particularly at the battle of the Thames, in which he defeated Gen. Proctor and his Indian allies. In 1835 he was nominated for the presidency of the United States by the bulk of the Whigs and was also the candidate of the Anti-Masonic party. In the election of 1836 Van Buren triumphed. In 1839 Harrison was nominated by the Whigs for the presidency, Van Buren being again his opponent. After a campaign, famous in American history for its exuberant spirits and its introduction of various innovations, Harrison was elected in 1840, with John Tyler as vice-president, but died in Washington only a month after his inauguration. See *Life* by Stoddard (1888), and by Bostwick in Wilson's *Presidents of the United States* (1894).

**Harrow**, or **Harrow-on-the-Hill**, par. and tn., Middlesex, England, 9 m. n.w. of London. The famous school was founded in 1571, when Queen Elizabeth granted a royal charter to John Lyon. During the headmastership of Drury there were five future prime ministers in the school—Spencer Perceval, Lord Goderich, Sir Robert Peel, Lord Aberdeen, and Lord Palmerston. Another of Drury's pupils was Lord Byron. There have been added music and drawing schools, and in the Butler Museum there is every facility for studying archæology and natural history. See Howson and Warner's *Harrow School* (1898); Foxe's *Harrow* (1911).

**Hart**, a stag of the red deer after the 6th year, when the terminal snags or surroys of the antler have appeared.

**Hart, Albert Bushnell** (1854-1943), American historian, was born at Clarksville, Pa., and educated at Harvard and in Germany. In 1897 he was appointed professor of history at Harvard, and professor of government in 1910, retiring in 1926. Of his many scholarly and valuable books the following may be mentioned: *Introduction to the Study of Federal Government* (1890); *Formation of the Union* (1892); *Practical Essays on American Government* (1893); *American History Told by Contemporaries* (4 vols. 1898-1901); *Foundations of American Foreign Policy* (1901); *New American History*

(1917); *Causes of the War* (1917); *We and Our Government* (1923).

**Hart, Charles Henry** (1847-1918), American art critic, was born at Philadelphia. Through his numerous writings he became widely known as an authority on historical portraiture, devoting particular attention to paintings of Gilbert Stuart and exposing various artistic frauds.

**Hart, Joel T.** (1810-77), American sculptor, was born near Winchester, Clark co., Ky. Early successes with local commissions brought him an order for the statue of Henry Clay now in Richmond, Va. His principal sculptures were *Angelina*, *Woman Triumphant*, *Il Penseroso*, and portrait busts of Gov. Crittenden, Gen. Taylor, and Robert Wickliffe.

**Hart, John** (1708-80), signer of the Declaration of Independence, was born and died in Hopewell Township, N. J. He was a member of the Congresses of 1774-5-6, and was chairman of the New Jersey Council of Safety (1777-8).

**Hart, Sir Robert** (1835-1911), first baronet, inspector-general of Chinese customs; born at Portadown, co. Armagh. He was secretary to the allied commission at Canton (1858), and entered the newly-organized Chinese customs service, of which, in 1863, he became inspector-general. He organized a fleet of steamships to put down piracy and smuggling, devised a coast-lighting system, and planned the postal service now being extended throughout the country.

**Harte, Francis Bret** (1839-1902), American novelist and humorist, was born in Albany, N. Y. In 1854 he removed to California, and worked as a compositor on *The Golden Era* of San Francisco, in which his first literary work appeared. Bret Harte's experiences among miners made a powerful impression upon his mind, and his first literary efforts were sketches of the people and the scenes which he had observed. These attracted favorable attention, and he was soon promoted to the editorial staff of *The Era*. For a short time, he was connected with *The Californian*, the famous weekly with which Mark Twain and Charles W. Stoddard were also associated; and in 1867 he published his first volume of poems, *The Lost Galleon and Other Tales*.

In 1868 Harte became the first editor of the newly founded *Overland Monthly*, in which appeared many of his well known stories. In 1870-71 he was professor of literature

in the University of California. Migrating east in 1871, he became a contributor to *The Atlantic Monthly*, and devoted himself to literature and lecturing. From 1878 to 1880 he was U. S. consul at Crefeld, Germany, and from 1880 to 1885 at Glasgow. He then settled in England, where he died.



Francis Bret Harte.

A list of his published works includes: *Condensed Novels* (parodies, 1870); *Truthful James, and Other Poems* (1872); *Tales of the Argonauts* (1875); *Snowbound at Eagle's* (1886); *A Ward of the Golden Gate* (1890); *A Sappho of Green Springs* (1892); *Barker's Luck* (1896); *Under the Redwoods* (1901); *On the Old Trail* (1902).

Consult *Lives* by T. E. Pemberton, H. W. Boynton, and H. C. Merwin; also J. Erskine's *Leading American Novelists and Hazard's Frontier in American Literature* (1927).

**Hartebeest**, or **Hartbeest**, an antelope of the genus *Alcelaphus* or *Bubalis*, found in S. and E. Africa. The true hartebeest (*Alcelaphus* or *Bubalis cama*) stands about four feet at the withers, and is of a general grayish-brown color. It has long, heavily ringed horns, diverging in the form of a V. See ANTELOPE. Consult R. Lydker's *The Game Animals of Africa* and Roosevelt's *Life Histories of African Game Animals*.

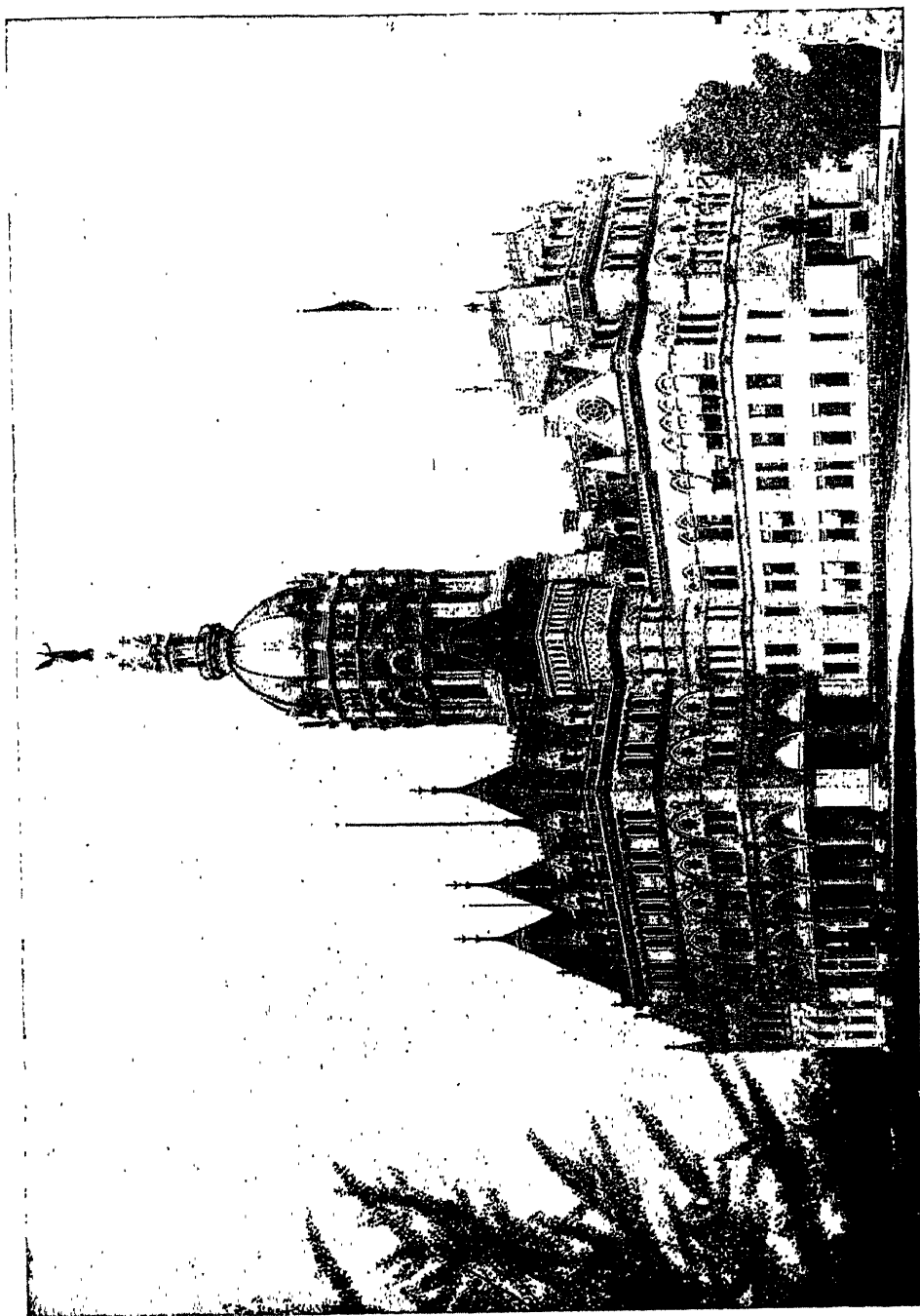
**Hartford**, city and port of entry, capital of Connecticut, and county seat of Hartford co., is situated at the head of navigation on the Connecticut River. Among many handsome buildings are the splendid white marble State Capitol, with its annex, the Supreme Court and State Library building; the old State House, later the City Hall, designed by Bulfinch, the architect of the national Capitol. The prominent educational and charitable institutions include Trinity College, the Hartford Theological Seminary, the school of Religious Pedagogy, and the American School for the Deaf. There are two daily papers, *The Hartford Courant* being the oldest in the United States.

Hartford has important manufacturing interests, including the largest typewriter product in the world, one of the chief printing houses in New England, extensive fire-arm and machine-gun works, machine factories, manufacturers of electrical machinery and supplies, airplane factories, and others.

The world-wide importance of the city, however, is as the second largest insurance center in America, after New York City, with proportionate banking facilities. In 1930 there were 46 insurance companies located in Hartford; p. 166,267. In 1624 the Dutch set up a trading post at the junction of the Park and Connecticut Rivers (Dutch Point), and in 1633 built a fort; but in 1635-6 English from Cambridge, Mass., settled along the river, and in 1637 named the place Hartford, from Hertford in England. In 1639 they adopted 'the first written constitution' of the world whence it has been sometimes called 'the birthplace of American democracy.' In 1654 the Dutch were ousted. For Andros' attempt on the charter in 1687, see CHARTER OAK.

The town's position as the distributing center for the Connecticut Valley, and the capital of an important colony, made it early the seat of able business men, and a leading port of West India trade. As a focus of New England Federalism in the War of 1812, it was in 1814 the meeting place, in the old State House, of the Hartford Convention. It was sole capital of Connecticut up to 1701; joint capital with New Haven thence to 1873; since then sole capital once more. Consult W. L. Twitchell's *Hartford in History*.

**Hartford Convention**, in U. S. history, a secret political convention that met at Hartford, Conn., from Dec. 15, 1814, to Jan. 5, 1815, at the suggestion of the Massachusetts legislature. It was composed of 26 Federalist delegates from Massachusetts, Con-



THE STATE CAPITOL, HARTFORD, CONN.

necticut, and Rhode Island, Cheshire and Grafton cos., N. H., and Windham co., Vt. George Cabot was president and Theodore Dwight secretary. The conflict with Great Britain in 1812-14 had been opposed from the first by the Federalists of New England, and the Hartford Convention was called to devise means of security and defence, and safeguard the rights of the individual States. Peace was established before the Convention adjourned. But the fact that the sessions of the Convention were held behind closed doors created a strong suspicion of disloyal tendencies; and while no treasonable act or intent was ever proved against the Convention, it hastened the fall of the Federalist Party. See **FEDERALISTS**. Consult T. Dwight's *History of the Hartford Convention*.

**Hartford Theological Seminary**, a non-sectarian divinity school, Hartford, Conn. In 1913 a new charter was granted, under the corporate name of the Hartford Seminary Foundation, to include the Hartford School of Religious Pedagogy and the Kennedy School of Missions.

**Hartlepool**, seaport and bathing resort, Durham co., England, on a peninsula in the North Sea which partly shelters the harbor to the south. The industries of the Hartlepoons include iron and steel works, electrical works, iron shipbuilding, lumber and corn mills. The docks cover 350 acres. On Dec. 16, 1914, in the World War, the towns of Hartlepool, Scarborough, and Whitby were bombarded by a German squadron, whereby 122 persons were killed, 549 injured, and heavy property loss inflicted; p. Hartlepool, 20,997, West Hartlepool, 69,370.

**Hartley, Sir Charles Augustus** (1825-1915), English engineer. He served as a member of the International Suez Canal Commission (1884-1907), and of the U. S. Engineering Board that reported on the improvement of the delta of the Mississippi River (1875); and as consulting engineer in improving the navigation of the Scheldt, Hugli, Don, and Dnieper Rivers, and the harbors of Odessa, Madras, Trieste, and Varna.

**Hartley, Jonathan Scott** (1845-1912), American sculptor. He was especially distinguished for his portrait busts. These include: *John Gilbert* (Player's Club, New York City), *Felix Morris*, *Otis Skinner*, *Victor Semper*, and *George Inness*. His public sculptures include: *Ericsson Monument* (New York City); *Alfred the Great* (Appellate Court House, New York City); *Thomas K.*

*Beecher* (Elmira, N. Y.) Among his ideal subjects are: *Nature's Sun Dial* (1907); *Cradle of Pan* (1912).

**Hartmann, Karl Robert Eduard von** (1842-1906), German philosopher. With the publication of *Die Philosophie des Unbewussten* in 1869 he achieved a conspicuous position among philosophical writers. The great aim he set for himself was that of harmonizing and reconciling philosophy with science by gathering up the varied results of modern scientific investigation into an all-comprehensive philosophic conception of the world.

**Hartmann von Aue** (c. 1170-1210), German poet. We have from his pen lyrical poems, and four longer works: *Gregorius*, *Der Arme Heinrich*, upon which Longfellow based his *Golden Legend*; *Erec*, and *Iwein*, two translations, or more correctly speaking, free renderings, of the *Erec* and *Chevalier au Lion* of Chrétien de Troyes.

**Hartness, James** (1861-1934), American engineer and inventor, was born in Schenectady, N. Y. Among his inventions, over a hundred of which have been patented, are the flat turret lathe (1891); the Loswing lathe (1904); and the turret equatorial telescope (1909). He was president of the American Society of Mechanical Engineers (1914).

**Hartshorn, or Spirits of Hartshorn**, a volatile preparation of ammonia, formerly obtained by the distillation of horn, bones, etc. See **AMMONIA**; **SMELLING SALTS**.

**Hart's-Tongue** (*Scolopendrium*), a genus of widely distributed ferns, of which one species, *S. Scolopendrium*, is found in America. The genus is widely distributed in Europe, Asia, and Africa.

**Hartt, Charles Frederick** (1840-78), American geologist. He was a member of the geological survey of New Brunswick (1864), and proved the existence there of primordial strata; was professor of geology and physical geography at Cornell; and was appointed chief of the geological survey commission of Brazil (1875).

**Hartzell, Joseph Crane** (1842-1929), American Methodist Episcopal bishop. He was elected missionary bishop for Africa, where he was very successful in founding missions. He acted as special diplomatic representative of the government of Liberia.

**Harvard, John** (1607-38), American clergyman, was born in Southwark, London. He was graduated from Cambridge University (1631), and was ordained a dissenting minister. In 1637 he came to New England, and settled in Charlestown, becoming freeman of

Massachusetts Bay Colony. At his death, a year later, he left a bequest of one-half of his estate, together with his library of 260 volumes, to help endow the new school at Cambridge which the General Court of the Colony had provided for in 1636. The General Court thereupon ordered that the institution should be called Harvard College. (See HARVARD UNIVERSITY.) Consult H. C. Shelley's *John Harvard and His Times* (1907); A. S. Pier's *Story of Harvard* (1913); S. F. Batchelder's *Bits of Harvard History* (1924).

**Harvard College Observatory**, the astronomical department of Harvard University, founded in 1843, is located in Cambridge, Mass. It is maintained chiefly for research work, special attention being given to stellar photography, photometry, and spectroscopy. The entire sky is systematically and repeatedly photographed. These photographs are constantly resorted to as the only record of the history of some astronomical happening. There is also a large library. Equally important to many astronomers are the great catalogues which contain the photometric and photographic magnitudes of the spectral types of hundreds of thousands of stars. Detailed study has resulted in many important discoveries, such as new variable stars, novæ, and the eighth and ninth satellites of Saturn. Since 1891 a station has been supported at Arequipa, Peru. *Annals* are published, supplemented by *Circulars* and *Bulletins*.

**Harvard University**, the oldest and one of the most influential institutions of higher learning in the United States, is located in Cambridge, Mass. It was founded in 1636 by a grant of \$2,000 by the Massachusetts Bay Colony, at 'Newetowne,' afterwards Cambridge, and named Harvard College in honor of John Harvard, a non-conformist clergyman who bequeathed his library of 260 volumes and half of his estate to the institution. In 1637 the first building was erected, and in 1642 the first class was graduated. The Reverend Henry Dunster was elected President in 1640.

In 1650 a charter was granted by the General Court, intrusting the internal administration to a corporation consisting of the president, five fellows, and the treasurer, to be known as the President and Fellows of Harvard College. During the administration of the early presidents the college was greatly hampered by religious and political controversies. At the opening of the 19th century, however, it had entered upon a period of vigorous and steady growth. Among distin-

guished professors at this time were Henry W. Longfellow, Oliver Wendell Holmes, and James Russell Lowell. Many of the most famous figures of the day were graduates.

In 1807 began the expansion of the College into a real institution comprising numerous units of learning and experimental study. The establishment of the Botanic Gardens was followed by the Arnold Arboretum, Peabody museum of ethnology and archæology, Agassiz Museum of Natural History, the Fogg Art Museum, and other valuable additions. The growth of graduate schools followed, expanding the college to a university of eminence equal to Oxford and others abroad. In 1816 the Medical School was organized with a separate faculty. The Law School was established in 1817, the Divinity School in 1819, and the Dental School in 1867.

Transition from college to university was effected during the presidency of Charles W. Eliot, whose administration began in 1869. To him are due the expansion of the elective system, the higher standard for admission, the organization of regular graduate instruction, and the encouraging of professional study. A degree with distinction was established for those attaining honors in their special fields. In 1906 the Graduate Schools of Applied Science were established.

President Eliot resigned in May, 1909, after forty years' service, and was elected president emeritus, an office especially created for him. Dr. A. Lawrence Lowell, was inaugurated president in October, 1909. University extension work was begun in 1910; the Graduate School of Medicine was founded in 1912; and the Graduate School of Business Administration in 1913. During President Lowell's administration a great expansion of the quarters of the university took place. This included the starting of the 'House Plan' of residential units for the students. The Graduate School of Business Administration was housed in a series of fine buildings across the Charles River, made possible by the gift of Mr. George F. Baker of New York. A new art museum and chapel were built; and a completely equipped laboratory for research work and lectures in the sciences.

President James Bryant Conant succeeded Lowell on his resignation in June, 1933. Emphasis on research and encouragement of the specially gifted scholar by fellowships have shown the new administration to be maintaining Harvard's reputation as one of the most influential universities in the world. Associated with the University, there was

founded in 1879 Radcliffe College, offering to women substantially the same courses and instructors as those of Harvard College. Among other departments are the University Library, with 2,784,300 bound volumes and Widener Memorial Library, dedicated in 1915, and containing 3,471,934 volumes.

Among the buildings of the University, the oldest, including Massachusetts Hall (1720), Wadsworth House (1727), Holden Chapel (1744), and Harvard Hall (1765), are located in Harvard Yard, in the heart of the city of Cambridge. Other buildings of special interest in or near the Yard are Memorial Hall, erected by the alumni in honor of graduates who fell in the Civil War; the Music Building, completed in 1914; the Germanic Museum. On Soldiers' Field, an athletic ground of twenty acres beside the Charles River, is located the famous Stadium, with a seating capacity of 57,750. as well as the University boat house. The Medical School occupies five buildings in Boston which were erected in 1906 on a 26-acre plot, and surrounded by hospitals available for the various fields of medical research. The University also possesses the Harvard Engineering Camp of 700 acres in Squam Lake, N. H.; and Harvard Forest, of 2,000 acres, at Petersham, Mass.

The number of students for the year 1941 was 8,400. The graduate schools comprised: Arts and Sciences, Business Administration, and Education. Professional Schools in the University now include: Engineering, divinity, law, medicine, dentistry, public health, architecture, landscape architecture, city planning. Harvard University maintains close relations with a number of other institutions. Exchange professorships are maintained. The publications of the University are numerous, and most of them are now issued from the Harvard University Press, established in 1913. Among student publications are the *Harvard Crimson* (daily), and the *Harvard Lampoon*, a humorous periodical.

The presidents of Harvard University have been: Henry Dunster (1640), Charles Chauncy (1654), Leonard Hoar (1672), Urian Oakes (1679), John Rogers (1680), Increase Mather (1685), Samuel Willard (1701), John Leverett (1708), Benjamin Wadsworth (1725), Edward Holyoke (1737), Samuel Locke (1770), Samuel Langdon (1774), Joseph Willard (1781), Samuel Webber (1806), John T. Kirkland (1810), Josiah Quincy (1829), Edward Everett (1846), Jared

Sparks (1849), James Walker (1853), Cornelius C. Felton (1860), Thomas Hill (1862), Charles W. Eliot (1869), Abbott Lawrence Lowell (1909), and James Bryant Conant (1933- ).

Consult C. W. Eliot's *Sketch of the History of Harvard University*; *Official Guide to Harvard*; Slosson's *Great American Universities*; Annual Catalogue of the University.

**Harvard Tercentenary.** In 1936 Harvard University celebrated its three hundredth year. From June 15 to September 25 the entire university, with its libraries, its museums, its observatories and its laboratories, was thrown open to the public for inspection. Guides were provided to escort the thousands of sightseers through its historic yard. Harvard was on display, and its treasures were shown in numerous unusual exhibits scattered throughout the grounds. A rare loan of priceless Japanese art treasures sent from every part of the world was placed on exhibit at the Boston Museum of Fine Arts during the latter part of the Tercentenary celebration. This collection was believed to be the most important group of examples of Japanese art ever brought together outside Japan. It included some of the finest screens ever painted.

From August 31 to September 12 Harvard held its important conferences in the arts and sciences. To these conferences came seventy-two of the most famous scholars of the world. These sessions covered every field of human knowledge, and though many of the papers which were read were in foreign languages, Harvard marshaled its own staff of experts in foreign languages to translate them. The more popular of the lectures given during these sessions were broadcast throughout the country, and the essence of all the lectures was recast in terms which every layman could understand and printed by the daily press. President Franklin D. Roosevelt, a Harvard graduate, delivered an address.

The celebration reached its climax on September 16, 17 and 18. These three days saw the assembling of one of the most brilliant and scholarly groups brought together within this generation. Aside from the 10,000 alumni of the University, delegates from 530 colleges and universities were the invited guests of Harvard. Delegates were present from most of the colleges in the United States and from forty foreign countries. They were officially received and greeted by President Conant of Harvard. September was given over to the alumni of the college, and a meeting of the

Associated Harvard Clubs. On this day Harvard received gifts of a great Chinese dragon, twenty feet high, from alumni of the college now living in China, and of a Japanese stone lantern, almost as old as the college itself, from Japanese graduates. In the evening, a tremendous display of fireworks, lasting for nearly two hours, closed the ceremonies for the day.

The most important event of the next day was the awarding of the honorary degrees to 62 scholars. After the invocation by Dean Sperry, the salutatory oration in Latin by Prof. Rand, and the address of the Tercenary Historian, Prof. Morison, John Masefield, poet laureate of England, read the poem which he had written for the occasion. Then President Conant spoke at some length on *The University Tradition in America—Yesterday and Tomorrow*, making a vigorous plea for intellectual freedom. In a colorful ceremony, the honorary degrees were then granted. A partial list of the recipients of these degrees will serve to show how illustrious a group of scholars had been assembled.

Nobel prize winners given honorary degrees were: Edgar Douglas Adrian, the neurophysiologist; Friedrich Bergius, chemist; Arthur H. Compton, physicist; Hans Fischer, famous for his work with chlorophyll; Sir Frederick G. Hopkins, biochemist; August Krogh, physiologist; Karl Landsteiner, physiologist; Hans Spemann, zoologist; Thé Svedberg, physical chemist; Otto Warburg, physiologist.

Others receiving degrees included: Charles McLean Andrews, historian; Edward B. Bailey, geologist; Rudolf Carnap, philosopher; Elie Cartan, mathematician; John Harold Clapham, economist; Peter Debye, physicist; Charles H. Dodd, theologian; Sir Arthur Stanley Eddington, astronomer; Etienne Gilson, philosopher; Werner Jaeger, philologist; Pierre Janet, psychologist; Hans Kelsen, jurist; Bronislaw Malinowski, anthropologist; Friedrich Meinecke, historian; Paul Pelliot, archaeologist; Kiyoshi Shiga, physician; Hu Shih, philosopher; and Leopold Wenger, jurist.

The meeting was adjourned to be reopened again in 2036.

**Harvest Moon**, the full moon nearest to the autumnal equinox.

**Harvey, Sir John**, governor of the colony of Va. After Yeardley's death, he was appointed governor (1629) and soon got himself well hated. An assembly of the Colony expelled him in 1635, but he was restored the

next year by the king, who, however, removed him finally in 1639.

**Harvey, William** (1578-1657), the discoverer of the circulation of the blood, was born at Folkestone, Kent, England. He became Lumleian lecturer in 1615. In his course of lectures he enunciated the theory of the double circulation of the blood.

**Harveyized Steel**, steel face-hardened by the process invented by Mr. H. A. Harvey. The treatment is chiefly applied to armor plates. By this invention, all-steel plate had its outer face placed flat on a carbonaceous material and was covered, firmly pressed, and heated for a period of several weeks; after which it absorbed enough carbon to harden it. By chilling it was uniformly hardened.

Owing to the tenacity of Harveyized steel, and the entire homogeneity of the plate, there is no cracking or peeling, nor, except in the case of very heavy projectiles, any complete piercing.

**Harwich**, England, 70 m. n.e. of London. It is fortified, has great continental trade, and cement works, shipbuilding, and fishing. Off the town Alfred's fleet encountered the Danes in 885, and in 1666 a naval engagement took place between the Dutch and the English; p. 12,700.

**Harz Mountains**, the mountainous region in the middle of Germany. The general altitude is from 2,000 to 3,500 ft.; but the Brocken culminates in 3,750 ft. Being well forested and richly endowed with the wild and gloomy associations of the Teutonic imagination, the Harz Mts. are a favorite summer resort. Mining for silver and lead has been carried on for hundreds of years.

**Hasbrouck Heights**, borough of New Jersey near Jersey City; p. 6,716.

**Hasdrubal**, ancient Carthaginian leaders. (1.) The son-in-law of Hamilcar Barca, who, on the latter's death in 228 B.C., succeeded to the chief command in Spain. (2.) The brother of Hannibal, defeated by Claudius Nero and Livius at the Metaurus in 207, himself being killed.

**Hashish**, an Oriental preparation made from the flowering tops of Indian hemp (*Cannabis sativa*). It is used in several countries as an intoxicant. In large doses its preparations quicken the circulation, and exhilarate the spirits, producing a kind of mirthful delirium.

**Hassam, Childe** (1859-1935), American artist, distinguished especially for his landscapes and figures in oils and etchings. He won the Saltus Medal in 1935.

**Hassan** (625-669) and **Hussein** (629-680), or **Hosein**, sons of Ali and Mohammed's daughter Fatima. Hassan was proclaimed caliph at Kufa on the death of his father in 660, but made terms with his rival, Moawiya. He is said to have been poisoned by one of his wives in 669. His brother Hussein, of a more war-like temper, was put to death by Moawiya's troops at Kerbela in 680. The Shiites celebrate their 'martyrdom' annually with a passion play, and great solemnities. See Matthew Arnold's 'A Persian Passion Play,' in *Essays in Criticism* (3d ed. 1875).

**Hassler, Ferdinand Rudolph** (1770-1843), first superintendent of the U. S. Coast Survey, born at Aarau, Switzerland. From 1807 to 1810 he was professor of mathematics at West Point.

**Hastings.** (1.) Parliamentary borough and seaside resort, in Sussex, England, on the English Channel. The town is fronted by parades along the shore for about three m. On West Hill are the ruins of the castle built by William the Conqueror; p. 65, 199. (2.) City, Neb., co. seat of Adams co. It is the center of an extensive grain and cattle district, and the milling industry is important.

**Hastings, Warren** (1732-1818), English administrator. In 1750 his guardian sent him to Calcutta as a writer in the East India Company's service. In 1769 he returned to India as a member of the Council of Madras—a post exchanged in 1772 for the governorship of Bengal. Meanwhile the affairs of the company had come under the consideration of Parliament, and the Regulating Act of 1773 was passed. Hastings was named in the act as governor-general for a period of five years. To the genius and foresight of Warren Hastings is due the consolidation of the Indian empire. Bombay and Madras were saved, the Marathas checked, Rohilkhand conquered, and the hopes of the French extinguished. On his return to England in 1786 Hastings was received with distinction by George III., and the directors of the East India Company acknowledged his services by a unanimous vote of thanks. But the Whig opposition vehemently denounced his conduct of Indian affairs, and succeeded in carrying in the House of Commons a motion for his impeachment. The trial began in Westminster Hall on Feb. 12, 1788, the leaders of the impeachment being Burke, Fox, Sheridan, Windham, and Grey. Hastings was acquitted. Before his death the tide had turned, and the popular voice testified to the value

of his services to the empire. See Lawson's *Private Life of Warren Hastings* (1895), and Macaulay's *Essay*.

**Hastings, Battle of.** On Sept. 28, 1066, William, Duke of Normandy, landed at Pevensey Bay to enforce his claim to the English crown. The English king, Harold, took up a strong position on the hill of Senlac to dispute William's advance. William drew the English from their stockade, which was attacked on the flanks, and the position carried.

**Hat.** A cap of classic origin (Phrygian bonnet), probably made of fur, was worn in Anglo-Saxon times. Under the Normans (Henry I.) the hood, copied even in armor, still prevailed, and the cap had developed a peak, precursor of the brim. In the next century (Richard II.) feathers and fantastic cloth ornaments were worn in broad-brimmed hats for men. The Puritans affected a high crown and stiff brim, not so broad; the broad brims gradually developed the 'cocked hat' of the 18th century, which passed away with the revolution (1789). Carried for show, the 'pretty black beaver tucked under the arm' was very costly, but continued to be full-dress costume even when the bell-shaped beaver came in under the prince-regent (1811-20). The tall silk hat was brought from Florence to France, and thence (1840) to England. The soft felt, stiff felt, and silk form the three types for men worn at the present day, with the panama for summer.

**Hathaway, Anne** (1556-1623), wife of Shakespeare. Her cottage is one of the restored places near Stratford-on-Avon.

**Hatia**, isl., Noakhali dist., Bengal, India, at the Meghna mouth of the Ganges. In the cyclone of Oct. 31, 1876, it was completely submerged, and 30,000 people perished.

**Hatien**, tn., Cochin-China, French Indo-China, 155 m. w. s. w. of Saigon, on the coast of the Gulf of Siam. Fishing and the cultivation of pepper are the chief industries.

**Hatteras, Cape**, cape at the extremity of a low sandbank, N. Carolina. It is separated from the mainland by Pamlico Sound. Violent storms occur, and the coast is dangerous.

**Hatto**, archbishop of Mainz. Two Hattos have been more or less confused in the chronicles. **HATTO I.** (c. 850-913) and **HATTO II.** (d. 970).

**Hatton, Joseph** (1841-1907), English novelist and journalist, special correspondent in Europe for the *New York Times*. *Bitter Sweets*, his first novel (1865), was followed by *Clytie* (1874). *By Order of the*



Czar—condemned by Russian censor (1890), *When Greek meets Greek* (1895). In *Male Attire* (1900). He wrote also *The New Ceylon* (1881), dealing with North Borneo.

**Hauberik**, an accoutrement which was originally intended as defensive armor for the neck, but which, as early as the end of the 12th century, had developed into a tunic of chain-mail.

**Hauck, Minnie** (1852-1912), American soprano singer. She studied in Europe, made her début in New York in 1868, and in 1869 was prima donna at the Vienna Court opera. Her best-known rôle was Carmen.

**Hauff, Wilhelm** (1802-27), German author, was born and died at Stuttgart. Although only twenty-five years of age at his death, he had written fairy tales, poems, one novel (*Lichtenstein*), a few short stories and a playful fantasy (*Phantasien im Bremer Ratskeller*—Eng. trans. 1889), which have gained an enduring place in German literature. *Lichtenstein* (1826; Eng. trans. 1859) exhibits the influence of Scott's historical novels.

**Haultain, Sir Frederick William Gordon** (1857-1942), Canadian public official; served as a member of the Northwest Council in 1887, of the Northwest Advisory Council from 1888 to 1897, and as premier, attorney-general, and commissioner of education for the Territories from 1897 to 1905. He was the leader of the struggle for responsible government in the Territories and played a leading part in shaping their educational development. He was appointed Chief Justice in 1912. He received knighthood in 1916. He was one of the original members of the Senate in the University of Saskatchewan (1907), and was elected Chancellor of the University in 1917.

**Haupt, Herman** (1817-1905), American engineer, director and chief engineer of the Pennsylvania Railroad (1847-61), during which time he superintended the construction of the Hoosac Tunnel. During the Civil War he superintended the United States military railroad, and was afterwards general manager of the Northern Pacific Railroad.

**Hauptmann, Gerhart** (1862), famous German dramatist, was born in Salzbrunn, Silesia. He studied art in Breslau (1881-3) and Dresden, and philosophy and natural science at the University of Jena, and eventually settled in Erkner, a suburb of Berlin. In 1889 his drama, *Vor Sonnenaufgang*, a study of social conditions, was produced in Berlin. It met with a storm of both approval and

dissent and placed its author in the front rank of German playwrights. This was followed among others by *Friedenfest* (1890); *Einsame Menschen* (1891); the comedy *Kollege Crampton* (1892); *Die Weber* (1892), his greatest social drama; *Fuhrmann Henschel* (1898); *Rose Bernd* (1903), *Und Pippa Tanzt* (1906); and the novels *Der Narr in Christo Emanuel Quint* (1910), *Atlantis* (1912); his many other works include *Till Eulenspiegel* (1927), *Wanda* (1928), *Goethe* (1932). Hauptmann is a realist; but he is successful when dealing with the ideal and fanciful, and to this realm belong two of his most popular works, *Hanneles Himmelfahrt* (1893) and *Die versunkene Glocke* (1896). *Der arme Heinrich* (1902) is considered by some critics one of his best plays. In 1912 Hauptmann received the Nobel prize for literature. An authorized edition of his *Dramatic Works*, in English, edited by Ludwig Lewisohn, was published in 1912. Consult Hale's *Dramatists of To-day* (1911); Holl's *Gerhart Hauptmann: His Life and His Work* (1913).

**Hauran** (anc. *Auranitis*), district of Syria, e. of the Jordan. The name is applied to Hauran proper—Jedur, Jaulan, and part of the hill country s. of the Yarmuk; and the district extending e. of Jaulan to the desert, and from the district of Damascus to the Yarmuk.

**Hausas**, or **Houssas**, a west African race, in British Nigeria. Their language, a variety of the Hamitic group, but with a strong Semitic tinge, is 'a sort of *lingua franca*' in Central and West Sudan, between Lake Chad and the Niger. Of medium height and black complexion, they represent the highest negro type, and have long had a native civilization. Consult C. H. Robinson's *Hausaland*, and *Nigeria and Hausa Grammar*; Rotttray's *Hausa Folklore, Customs, Proverbs* (2 vols., 1913).

**Hausmann, Georges Eugène, Baron** (1809-91), prefect of the Seine and the builder of modern Paris, was born in that city. He literally transformed the city; but the heavy financial burdens which these improvements laid upon the citizens led to severe strictures on the part of the Corps Législatif, and in 1870 Hausmann was forced to resign.

**Haute-Garonne**, frontier department of Southwestern France, extending along the Upper Garonne. The capital is Toulouse; p. 432,126.

**Haute-Loire**, department of South-central France. It is traversed from n. to s. by four

mountain chains which reach their highest point in Mont Mezenc (5,755 ft.) in the s.e. The Loire waters the eastern part and the Allier the western. The capital is Le Puy; p. 260,610.

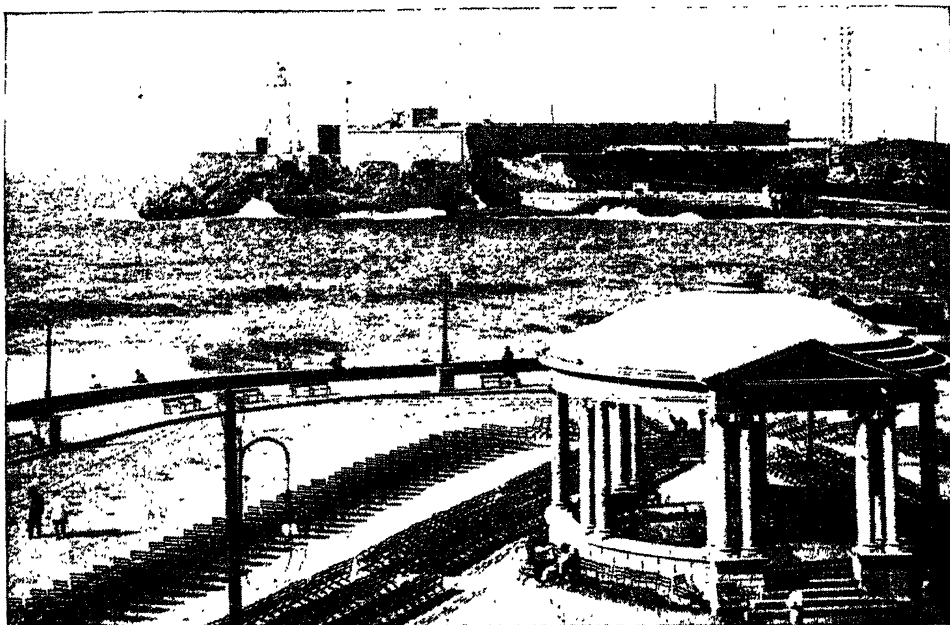
**Haute-Marne**, department of Eastern France, divided by the north-flowing Marne. In the s. is the Plateau de Langres between the Marne and the Aube. The capital is Chaumont; p. 195,370.

**Hautes-Alpes**, department of Southeastern France, on the Italian frontier. The surface is mountainous, Pointe des Ecrins (13,462 ft.), the loftiest peak of the Dauphiné

and the Arve. It is a favorite tourist resort. The capital is Annecy; p. 275,317.

**Hautes-Pyrénées**, frontier department of France, on the Spanish border. The southern part is mountainous, culminating in the Vignemale (11,000 ft.), the loftiest peak of the Pyrenees in France. The chief rivers are the Gave de Pau, the Adour and the Neste. The capital is Tarbes; p. 187,875.

**Haute-Vienne**, department of Central France. The Blond and Ambazac Hills and the Monts du Limousins diversify the surface. The chief rivers are the Dordogne and the Vienne with its tributaries. Kaolin, used



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*Havana Harbor: Morro Castle in the Distance.*

Alps, being the highest point. The chief rivers of Hautes-Alpes are the Drac and the Durance. The capital is Gap; p. 87,963.

**Haute-Saône**, department of Eastern France. The Saône river traverses it from n. to s., and the Ognon forms the greater part of the southern boundary. Forests cover about a fourth of the surface. The capital is Vesoul; p. 226,313.

**Haute-Savoie**, frontier department of France, forming part of the southern shore of Lake Geneva. The surface is mountainous, culminating in the s.e. in the lofty range of Mont Blanc: it is traversed by the Rhone

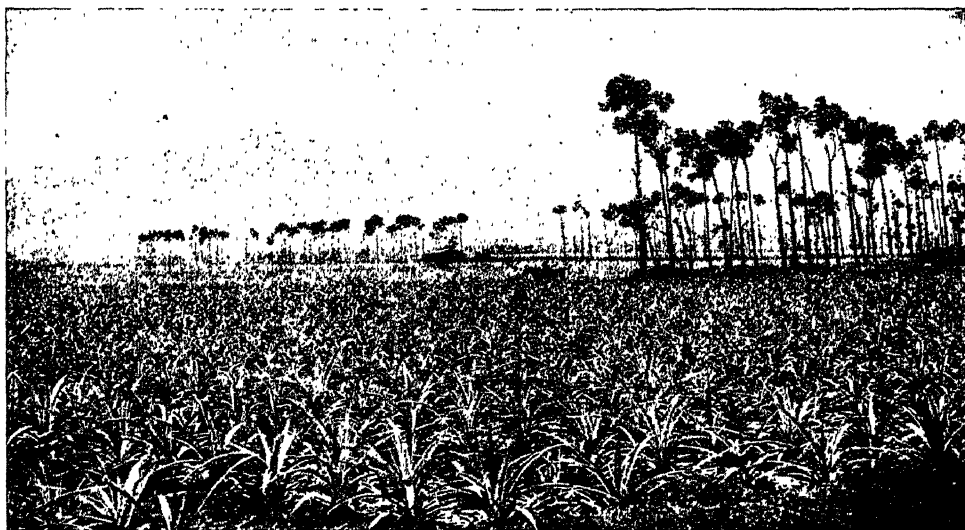
in the porcelain works of Limoges, is quarried at St. Yrieix. The capital is Limoges; p. 351,311.

**Havana**, capital and chief city of Cuba and the capital of the province of Havana, is situated on the northern shore of the island, towards the western end; it is the commercial center of the West Indies. It occupies a low peninsula with the sea on the n. and the harbor on the e. This harbor is over 3 m. long and is one of the finest in the world. On the s. and w. the city is backed by an amphitheatre of hills rising up to Morro Castle across the bay. The climate is humid and

hot, but under proper sanitary conditions, not unhealthful. The old city, surrounded by a wall until 1863, is a network of small streets, which, until the American occupation in 1898-1902, were in an unsanitary condition, breeding yellow fever. Under the American administration, many of the streets were widened and repaved, the sewers were cleared and improved, and the houses were overhauled, so that the mortality from yellow fever fell from 1,262 in 1896 to 4 in 1901. Outside the walls in the newer part of the city, upon the hill, there are wide, well-paved streets, shaded with fine trees, diversified with parks, and bordered with large villas. The Alameda de Paula, along the bay, is a

present situation four years later. It has been the scene of much turbulence; has been burned by pirates (1528), has been sacked (1555; 1563), was attacked by Drake (1585) and by the Dutch (several times in the 17th century), and captured by the English (1762), but subsequently restored to Spain. The blowing up of the United States battleship *Maine* in the harbor on Feb. 15, 1898, precipitated the Spanish-American war, in which the city and harbor were blockaded. In 1912 the remains of the battleship were removed and sunk in the ocean by the U. S. Government; p. 569,000.

**Havas Agency**, or more properly the **AGENCE HAVAS**, a French news-distributing



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*A Field of Hawaiian Pineapples.*

popular promenade. The houses are low and square, built mainly of stucco, vividly colored; the larger residences are built around a courtyard in the Spanish fashion.

Among the chief buildings are the former palace of the governor-general, the cathedral, where, as some believe, the ashes of Columbus were laid, and the bishop's palace. There are many theatres and several clubs, a bull ring, an opera house, a public library, and botanical gardens. The principal educational institutions are the University of Havana (founded by the Dominicans 1670), and the Jesuit College de Belen. Havana is the center of the tobacco industry of Cuba. Havana was settled (1515) by Diego de Velasquez on the s. coast of Cuba and was moved to its

organization, had its beginnings when Charles Havas (1785-1858) was authorized by Napoleon to send despatches from the general staff quarters to the newspapers of that time. It became one of the chief European press services.

**Havelock, Sir Henry** (1795-1857), English soldier. Ordered to relieve Cawnpur and Lucknow during the mutiny, he defeated the rebels and entered Lucknow, Sept. 25, 1857, in the residency of which he was himself besieged for nearly two months. He wrote *Narrative of the War in Afghanistan* (1840), and *Memoir of the Campaign in Ava* (1828). Consult Marshman's *Memoir*.

**Haven, Erastus Otis** (1820-81), American Methodist-Episcopal clergyman and edu-

cator, was born in Boston. He was editor of *Zion's Herald* (1856-63), president of Michigan University (1863-9), and president of Northwestern University (1869-72). In 1874 he was made Chancellor of Syracuse University.

**Haverford College**, an institution of learning located at Haverford, Pa. (8 m. n.w. of Philadelphia), under the control of the Society of Friends, opened in 1833 as a school for the mental, moral, and physical training of the children of Friends. The school gradually developed into a college.

**Haverhill**, city, Essex co., Massachusetts. Manufacturing interests are extensive. On the road to the birthplace of John Greenleaf Whittier, about 3 m. from the town, is Lake Kenosha, named by the poet. Haverhill was founded in 1640 by eight men from Ipswich and four from Newbury. It was the subject of frequent Indian attacks and was the scene of the famous raid in which Hannah Dustin was carried off in 1697. On Aug. 29, 1708, a party of French and Indians attacked the village and massacred or carried off 40 of the inhabitants. In 1645 Haverhill became a town, and in 1870 a city; p. 46,752.

**Haverstraw**, village, New York, Rockland co., is situated on Haverstraw Bay, the widest part of the Hudson River. The Ramapo Mountains here reach the river in the bold headland Point-no-Point, while High Tor stands directly back of the village. Industries include brick plants. The place was settled about 1700 and here at the 'Old Treason House,' Benedict Arnold and Major Andre met to arrange for the surrender of West Point to the British (September, 1780). In 1825 the short-lived 'Haverstraw Community' was started; p. 5,909.

**Havildar**, the highest rank of non-commissioned officer among native troops in India and Ceylon.

**Havre**, or **Le Havre** (a contraction of the original name, **LE HAVRE DE NOTRE DAME DE GRACE**), seaport and important commercial city, France, is situated on the English Channel. Its notable buildings include the 16th century church of Notre Dame, a museum, a Renaissance town hall. It is a fine harbor, with dock basins, quays, and a water area of about 218 acres. There are deep-water wharves capable of accommodating the largest vessels. The entrance channel, maintained at 33 ft. depth, has a tidal dock. Tancarville Canal leads to a very extensive network of inland waterways. Havre ranks among French ports in the number of vessels

entering as a rival of Cherbourg. It is an important point of emigration; p. 165,076.

**Hawaii**, the largest and southernmost island of the Hawaiian Archipelago. The island is composed wholly of lava poured out by 5 volcanoes, the highest of which rises nearly 14,000 ft. above the sea level. Mauna Loa (13,765 ft.), and Kilauea (4,400 ft.), are active volcanoes, situated in Hawaiian National Park. The latter, the largest active volcano in the world, having a crater about 9 m. in diameter, is visited by thousands of tourists each year, who go to the very rim of the 'pit of eternal fire.' Mauna Kea (13,823 ft.), the highest of them all, is quiescent. The island is about 300 m. in circumference and 4,016 sq.m. in area. The population in 1930 was 73,325. Hilo, the most important city, has a population of 19,468. It is an important shipping port for sugar.

**Hawaiian Islands**, formerly the Sandwich Islands, an archipelago in the North Pacific Ocean, forming a territory of the United States, lying 2,100 m. from San Francisco. The archipelago consists of hundreds of islands scattered through 1,500 m. They include nine inhabited islands: Hawaii, Maui, Oahu, Kauai, Molokai, Lanai, Niihau, Kahoolawe, and Midway. The islands are wholly of volcanic origin with minor coral additions. They are built up along a crack in the ocean floor by a string of volcanoes, some of which have reared themselves as much as seven m. straight up from the bottom of the ocean. On Maui is the extinct crater of Haleakala (House of the Sun), the largest known crater in the world, measuring from 20 to 30 m. in circumference. The rivers of the islands are chiefly short mountain torrents. The coast is rocky, with stretches of sandy beach, and coral reefs.

Though within the tropics, the Hawaiian Islands enjoy a fairly temperate and healthful climate, due to the sea breezes that sweep over them. The average temperature in winter is 75° F. It seldom falls below 54° or rises above 90°. Rains brought by the n.e. trade winds are excessive and frequent on the windward, while the leeward side is dry and arid. Among many native plants, the taro is valued for its large beet-shaped root, from which is prepared poi, a native food; the wauti, or paper mulberry (*Morus papyrifera*), has bark made into clothing; and the ti (*Dracana*), has leaves used for clothing as well as for thatching houses. Fruits include the cocoanut, banana, bread fruit, orange, guava, mango, prickly pear, avocado, and

pineapple. The island is not rich in animal life. A great variety of fish are found in the surrounding waters; and coral and pearls are also found.

Agriculture is the main industry of the Islands. Sugar is the foundation of Hawaiian prosperity ruled by a financial oligarchy around which is built the business and social structure of the Islands. Honolulu is the chief port of the Islands. Dependent upon the major agricultural industries are such growing manufactures as sugar refining, canning, especially of pineapples and fish, rice, coffee, and tin milling, and iron and fertilizer works. Entertaining tourists ranks third as an industry. The remarkable healthy climate permits outdoor bathing and surf riding every day in the year. Lines of steamers connect the Island with the United States, Japan, China, the Philippines, Canada, and Australia. Travel on land is fairly well developed, over 374 m. of railway having been built, besides about 675 m. on the sugar plantations. Wireless telegraph and cable are in use. Commercial air services connect the islands.

According to the Census of 1930 the population of Hawaii was 368,336, of whom 22,230 were Hawaiians, 17,056 Caucasian-Hawaiians, 14,459 Asiatic-Hawaiians, 28,595 Portuguese, 7,000 Puerto Ricans, 1,253 Spanish, 43,517 other Caucasians. There were 27,235 Chinese, 146,189 Japanese, 6,653 Koreans, 65,515 Filipinos, and 805 others. The natives belong to the Malayo-Polynesian stock and resemble the native New Zealanders in their well-developed stature. They have broad, large faces, raven black hair, and are reddish-brown in color. They are good-tempered, fairly industrious, and mentally highly developed. Their language is related to the Malayo-Polynesian tongue. The Hawaiian Islands became a territory of the United States, with a republican form of government, on June 14, 1900. The territory is represented in the U. S. Congress by a non-voting delegate elected every two years. The capital is Honolulu, situated on the island of Oahu.

Hawaii is said to have been visited by white men as early as 1527, but its discovery is generally attributed to Captain James Cooke, who explored the Islands in 1778, named them the Sandwich Islands, after the Earl of Sandwich, and lost his life in an altercation with the native inhabitants in 1779. At the time of their discovery the islands were densely populated by a semi-civilized people living under a feudal governmental system with a king upon every island. Chris-

tianity was introduced by missionaries from America in 1820. The weakness of the kings led to a period of regencies by women—Kaa-humanu, Kinau, and Kekauluohi, who were deserving of great praise as rulers. Queen Liliuokalani, however, evaded the terms of the constitution, and leading citizens, mainly Americans, rose in rebellion, in January, 1893, deposed the queen, and applied for the annexation of Hawaii to the United States. A commissioner was sent to examine the situation, a provisional government was formed, and on July 4, 1894, a republic was proclaimed with Stanford B. Dole as president. In 1895 the queen was forced formally to abdicate her throne, and on Aug. 12, 1898, the islands were annexed to the United States. On June 14, 1900, they were organized as a Territory. In 1928, the 150th anniversary of Captain Cooke's discovery of the islands was celebrated with fitting ceremonies. Tension between naval and military personnel and civilians came to a climax in 1931 and as a result a report on crime and law enforcement in Hawaii was presented to the United States Senate in 1932. The attack on Pearl Harbor, Honolulu and Hickam field, Dec. 7, 1941, resulted in a declaration of war by the United States against the Axis powers. Consult W. A. Du Puy, *Hawaii and Its Race Problem* (1932); J. T. Faris, *Paradise of the Pacific* (1929); T. Griffiss, *When You Go to Hawaii* (1930); R. M. C. Littler, *Governance of Hawaii* (1929); A. Pittman, *After Fifty Years* (1931).

**Hawick**, town, Roxburghshire, Scotland. In the vicinity are Branhholme Castle, an old stronghold of the Scots of Buccleuch, the scene of Scott's *Lay of the Last Minstrel*.

**Hawk**, a term sometimes applied to all the diurnal birds of prey except owls and eagles, but used in a restricted sense to designate the Accipitrine section of the Falconidæ.

**Hawkbit**, a name applied to the members of the genus *Leontodon*. The Autumnal Hawkbit (*L. autumnale*), or Fall Dandelion, is the only species naturalized in the United States.

**Hawke, Edward, Baron** (1705-81), English admiral, was born in London. His great feat—one of the greatest ever performed by a British admiral—came in 1759, when during a fresh gale he destroyed the French fleet under M. de Conflans, in Quiberon Bay. He was created Baron in 1776.

**Hawkers and Peddlers**, persons engaged in the business of carrying about merchandise from place to place for sale or exchange. In

the United States the terms are used indiscriminately of itinerant merchants, whether traveling afoot or with wagon, and are not applied to wandering tinkers or cobblers.

**Hawkesbury**, river of New South Wales, Australia, rises in the Cullarin Range, and enters the Pacific at Broken Bay, about 20 m. n.e. of Sydney.

**Hawkeye State**, a popular name for Iowa. J. G. Edwards, the editor of the *Burlington Patriot*, was nicknamed 'Old Hawkeye,' and in 1839 his paper became the *Hawkeye and Patriot*.

**Hawkins, Hamilton Smith** (1834-1910), American soldier, was commandant at West Point in 1888-92. In the Spanish-American war he commanded the division which captured San Juan hill in the battle of Santiago.

**Hawk-moth**, one of the family Sphingidae, which are all large, powerful, dull-colored moths, with small hind-wings, hooked antennae, and smooth striped caterpillars, usually provided with an erect horn at the hinder end, which pupates in earth. To this family belong the death's-head moth, the handsome oleander hawk-moth (*Sphinx nerii*), the humming-bird hawk-moths (*Macroglossa*), often mistaken for humming-birds, and the pine hawk-moth, very destructive to pine trees in the Old World.

**Hawks, Francis Lister** (1798-1866), American P. E. clergyman, was rector of St. Stephens's and then of St. Thomas's in New York city. He established a school for boys, St. Thomas's Hall, at Flushing, L. I., in 1839, but it failed in 1843, involving Dr. Hawks financially. He removed to Holly Springs, Miss., and in 1844, when he was elected bishop of this diocese, there was opposition to his confirmation because of his pecuniary difficulties at Flushing. The diocese vote exonerated him, but he did not accept the bishopric. In 1849 he returned to New York and became rector of Calvary Church. His last pastorate was in charge of a new congregation in New York. He wrote the story of Commodore Perry's expedition and a history of North Carolina.

**Hawks, Frank Monroe** (1897-1938), American aviator, was born in Marshalltown, Ia. He was in the U. S. air service, 1917-19. Noted as a speed flier, he established several transcontinental records, was decorated by French and Swiss aero clubs and won the Harmon Trophy, 1930. He met death in a crash.

**Hawksbeard**, the popular name of plants belonging to several genera of the Compositae,

as to Hieracium, the rattlesnake weeds, and particularly to the genus Crepis.

**Hawksbee, or Hauksbee, Francis** (d. 1713), English physicist, holds a recognized place among early workers in electrical science. He was the author of *Physico-Mechanical Experiments* (1709).

**Hawksbill, or Caret**, a large sea-turtle (*Eretmochelys imbricata*), with a strong falcon-like beak, the plates of whose shell supply the tortoise-shell of commerce. It is taken in the West Indies and in Oriental seas.

**Hawkweed, or Hieracium**, is a genus of composite plants, characterized by yellow, orange, or red flowers, with imbricated involucre, furrowed and toothed fruit, and bristly pappus. It is a pest in meadows and pastures, especially in New York state.

**Hawkyns, or Hawkins, Sir John** (1532-95), English seaman, was born at Plymouth, and in 1562 engaged in the slave traffic, being the first Englishman to do so. Aided by the profits of smuggling, and of raids upon Spanish shipping, he was able to conduct two more voyages to the W. Indies, one in 1564, and another, with Drake, in 1567. In 1588 he was given a command against the invincible Armada.

**Haworth**, vil., 4 m. s. of Keighley, Yorkshire, England. The Brontë sisters lived and died here.

**Hawser**, a large rope or small cable of three or four strands, being smaller than a cable and much larger than a tow-line.

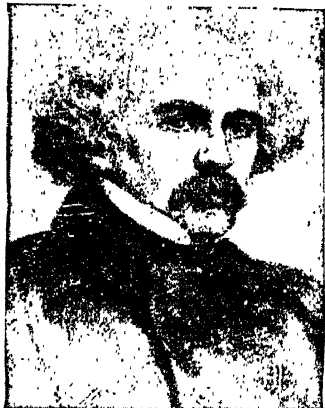
**Hawthorn, or May** (*Crataegus oxyacantha*), a small European tree or bush, belonging to the order Rosaceae, often employed abroad as a hedging plant. The flowers have a characteristic fragrance, and are followed by haws or fruit, which turn dark red in autumn.

**Hawthorne, Charles Webster** (1872-1930), American painter, founder of the Cape Cod School of Art at Provincetown, was born in Maine and studied in New York, where he worked in the day-time and attended the classes of Vincent du Mond and of George de Forrest in the evenings. He soon came under the influence of William M. Chase and later served as his teaching assistant. The first of the many prizes he earned was given by the Salmagundi Club in 1902.

**Hawthorne, Julian** (1846-1934), American author, son of Nathaniel Hawthorne. He was correspondent of the *New York Journal* in Cuba, and in 1901-3 was literary critic of the *Philadelphia North American*. He produced some historical works, such as *A History of the United States* (1899), and novels,

such as *Fool of Nature*, *Archibald Malmaison*, *Pearlshell Necklace*. He edited his father's unfinished work, *Dr. Grimshaw's Secret* (1883), and wrote concerning his father.

**Hawthorne, Nathaniel** (1804-64), American novelist, was born in Salem, Mass.,



Nathaniel Hawthorne.

July 4, 1804. His ancestors were Puritans of the sternest type. His personal attitude toward his friends and associates was essentially gentle and sympathetic. His first novel, *Fanshawe* (1828), was published anonymously. The original edition of his *Twice-Told Tales*, which had appeared singly at various times, was printed in 1837. The tales were commended by Longfellow, but did not attract general attention. In 1839 he accepted from George Bancroft, collector of the port of Boston, the office of weigher in the Custom House; and he held this post until 1841. His next literary effort was *Grandfather's Chair* (1841), a collection of sketches of New England history written for children; and then for about a year (1841-42), he was one of the Brook Farm community. Soon after retiring from Brook Farm he married Miss Peabody, of Salem, and went to live in Concord in the house which he afterward made famous by his *Mosses from an Old Manse* (1843). In 1850 *The Scarlet Letter*, the most vivid and convincing of all of Hawthorne's stories, was published, and his fame was established. The book was widely read in England as well as in America, and was hailed as a work of genius. *The House of Seven Gables*, written in the summer of 1850, at Lenox, Mass., was next published (1851), and emphasized the author's genius for treating the 'tragic phase of humanity.' Hawthorne also

produced a campaign *Life of Franklin Pierce*, his college friend, and in the winter months the *Tanglewood Tales* and a new series of *Wonder Book* stories. During the next four years, and decidedly against his wishes at first, he was American consul at Liverpool, England. The *English Note-Books* and *Our Old Home* tell of his life in that country. In 1857-58 he travelled in France, Switzerland, and Italy, of which countries he wrote in his *French and Italian Note-books*. While he was in Italy he outlined *The Marble Faun*.

In 1863 was published *Our Old Home*, which, despite the pleadings of his publishers, he insisted upon dedicating to ex-President Pierce, just at that time a decidedly unpopular person in the North. This was the last of Hawthorne's books to be published during his lifetime. Hawthorne wrote little after the spring of 1864. His health was failing, and the end was hastened by the sudden death in April of his friend and publisher, William D. Ticknor, in Philadelphia, whither Hawthorne had accompanied him. He had entertained a presentiment that he, too, would die away from home, and so it happened. With Mr. Pierce he went to the White Mountains in



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John Hay.

May, 1864, and in the night of the 18th of that month, at Plymouth, N. H., he died while he slept. His grave in the Sleepy Hollow Cemetery, at Concord, is close by those of

Emerson and Thoreau. Besides those mentioned his works include: *The Snow Image, The Blithedale Romance, Biographical Stories, Peter Parley's Universal History, The Dolliver Romance, Dr. Grimshawe's Secret, American Notebooks, Septimius Felton*. See the *Lives*, by Julian Hawthorne (1885); by Henry James, in the *English Men of Letters Series* (1880); by Woodberry, in the *American Men of Letters Series* (1902); the *Study of Hawthorne* (1876), by George Parsons Lathrop; and the *Memories* (1897) by Rose Hawthorne Lathrop.

**Hay.** Hay is the air-dried product of meadows, used for feeding animals. The quality of hay is affected by the nature of the soil, and by the species of grasses and plants composing it. The best hay contains a proportion of clovers and miscellaneous herbage of several kinds interspersed among the leafy parts and the young stems of the grasses. It should be secured in dry but not scorching weather, and should heat slightly in the stack or mow. Hay improves with age.

**Hay.** River, rises in dist. of Mackenzie, British North America, and flows n.e. for about 350 m. into Great Slave Lake.

**Hay, John** (1838-1905), American statesman and diplomat, was born at Salem, Ind. In 1861, after being admitted to the Illinois bar, Hay went to Washington as Lincoln's assistant secretary. After the assassination of Lincoln, Hay was sent to Europe as secretary of legation at Paris. In 1870 he returned to the United States and became an editorial writer on the staff of the *New York Tribune*. In 1897 he was appointed ambassador to England, and in the following year he was recalled to become Secretary of State, a post which he held until his death in 1905. As secretary of state Hay won a prominent place among modern diplomatists by his candid and tactful conduct of matters of international politics. Among his earliest achievements were the negotiation of a series of extradition treaties, and the settlement of long-standing grievances of American citizens against foreign powers. More important, from the American point of view, was his work in securing the abrogation of the Clayton-Bulwer treaty, which had proved an insuperable obstacle to the construction of an Isthmian canal, and the negotiation (in 1903) of a new treaty with England permitting the United States to exercise sole control over the canal. The subsequent negotiation of a treaty with Panama (the Hay-Varilla treaty) furth-

er identify the name of Hay with the Panama Canal project.

Hay's title to greatness as a diplomat rests chiefly upon his success in checking the territorial aggrandizement in China of Western powers, and in maintaining the 'open door' to all nations. In March, 1900, he addressed a circular letter to the Powers enunciating the principles that the Chinese government should exercise all the functions of territorial sovereignty, such as the collection of revenue, even in the spheres of influence of Western powers; that citizens or subjects of any foreign nation should enjoy the same rights and immunities in the sphere of influence of any power as were enjoyed by the citizens or subjects of that power; that customs and other taxes, including port and harbor dues, and charges on railways and inland navigation lines, should be uniform for citizens of all foreign powers. The principles contained in the circular were acceded to by every European power having interests in China. After the suppression of the Boxer uprising in 1900, plans for the partition of China, in punishment for the outrages upon foreigners, were considered by certain of the Western powers. Hay steadfastly upheld the rights of China, and was successful in maintaining the territorial integrity of that nation and the open door principle. Hay also gained distinction as a scholar and author. His most important work, written in collaboration with John G. Nicolay, is *Abraham Lincoln*, published in 1890. This work is one of the most important contributions to the history of the United States for the period from 1830 to 1865, as well as the most trustworthy account of the life and character of Lincoln.

**Hayashi, Tadasu, Count** (1850-1913), Japanese statesman and diplomatist, born at Sakura, Shimosa, Japan, was educated (1866-8) in England. Among many posts he was ambassador to Great Britain (1899-1906); minister of foreign affairs (1906-1908), and minister of commerce (1911-13). He is the author, in English, of *For His People* (1903), and of translations into Japanese.

**Haydn, Joseph** (1732-1809), Austrian musical composer, was born in Rohrau, near Vienna. When he was eight years old he joined the choir of St. Stephen's Cathedral, Vienna, and there remained till supplanted at 17 by his brother Johann. In 1760 he became leader of Count Morzin's band, and issued the first of his many symphonies, and



next year saw the beginning of his lifelong connection with his patrons the Esterhazys, and his appointment by them as musical director at Etsenstadt and Esterhaz. As musical director, Haydn wrote German and Italian operas, works for wind instruments, the clavier, the barytone, stringed quartets, and notably symphonies, among them *Farewell* and *Joy*. In 1791 he was commissioned by Salomon, the great London conductor, to write six great symphonies for England, which he directed himself. Six more great symphonies signalized a second visit in 1794. The 'Emperor's Hymn' (1797), *Gott erhalte Franz den Kaiser*, was possibly suggested by *God Save the King*. Two choral works, *The Creation* (1799) and *The Seasons* (1801), crown the end of a great career. He enjoyed a warm friendship with Mozart, and Beethoven was for a time his pupil.

**Hayes, Helen** (Mrs. Charles MacArthur) (1902- ), American actress, married in 1928. She was awarded a prize in 1932 by the Motion Picture Academy of Arts and Sciences as the outstanding actress of the previous year, based upon her star role in *Arrowsmith*. In 1934 she appeared in *What Every Woman Knows*. After four successful years of picture work, she returned, 1935, to the legitimate stage, scoring a triumph 1936-37 as Queen Victoria in *Victoria Regina*, and as *Harriet* in the play by that name, 1943.

**Hayes, Patrick Joseph** (1867-1938), American Roman Catholic cardinal. After serving in St. Gabriel's, New York City, in 1904 he was made president of the newly opened Cathedral College and filled that office until 1914 when he became rector of St. Stephen's Church, New York City. He was Catholic chaplain bishop for the U. S. army and navy during the war and in 1919 became archbishop of New York. In 1924 he was made a cardinal. August 20, 1935, he was appointed legate to the Eucharistic Congress in Cleveland by Pope Pius xi.

**Hayes, Roland W.** (1889- ), American Negro tenor, was born in Georgia and spent his childhood in Tennessee. He began musical training and subsequently enrolled at Fisk University, Nashville, Tenn., where he completed his musical education. After his first concert in Boston in 1917, his fame spread rapidly. See Helm, *Angel Mo' and Her Son, Roland Hayes* (1942).

**Hayes, Rutherford Birchard** (1822-93), 19th president of the United States, was born in Delaware, O. He served, with great credit, throughout the Civil War. He was a

Republican representative in Congress (1865-7); was governor of Ohio for two terms, in 1868-72; and in 1875, after a campaign which attracted national attention, and in which he ably and vigorously contended for 'sound money' as opposed to currency inflation advocated by the Democrats, he was again elected. In the following year he was the Republican candidate for the presidency, and, after the most famous election contest in American history—the result of the balloting in South Carolina, Louisiana, Florida, and Oregon being in dispute—was declared by the Congressional 'Electoral Commission' to be elected over his Democratic opponent, Samuel J. Tilden. He served as president from 1877 to 1881. He was active in promoting reconstruction measures, competitive examinations for governmental appointments, and relieved the South of the curse of its 'carpetbag governments' by withdrawing the Federal troops. In January, 1879, occurred the resumption of specie payments (suspended since the Civil War) in accordance with the Resumption Act of 1875. After retiring from the presidency he took an active and helpful part in the promotion of prison reform and of education.

**Hay-Fever**, a catarrhal condition of the mucous membrane lining the upper respiratory passages. Of the irritants the chief are the air-borne pollen grains of certain grasses acting on a sensitive mucous membrane. The causative pollens vary in different climates and regions. Why certain individuals are sensitive to pollens, while others, being equally exposed, remain unaffected, is still unknown. In some patients furs and feathers or the proximity of certain grasses or flowers play a leading part.

**Hayne, Paul Hamilton** (1830-86), American poet, was born in Charleston, S. C. He fought in the Confederate army in the Civil War, returning to find his home destroyed; he wrote to ease his poverty, becoming known as 'the Laureate of the South.' Among his works expressing the spirit of the South are *Legends and Lyrics* (1872); *Mountains and Lovers* (1875).

**Hayne, Robert Young** (1791-1839), American statesman. He was admitted to the South Carolina bar in 1812, attained prominence as a lawyer, was a member of the State legislature (1814-18), and was attorney-general of South Carolina (1818-22), and U. S. senator (1823-32) from that State. A determined advocate of States' rights and a vigorous opponent of protection, he was engaged with Daniel Webster in January, 1830, in one

of the most famous debates in American history. He was one of the leaders of the movement in South Carolina for the nullification of the 1832 tariff bill, and was elected governor, served from December 1832, to December 1834.

**Haynes, John** (?-1654), first governor of Connecticut Colony, was born at Copford Hall, Essex, England, and in 1633 emigrated to the Massachusetts Bay Colony. He founded the colony of Connecticut in 1636, was one of the five who formulated its constitution, and served as governor during each alternate year, which was as often as the law allowed, until his death.

**Hay-Pauncefote Treaty**, a treaty between Great Britain and the United States according to the provisions of which Great Britain renounced the right, guaranteed by the Clayton-Bulwer treaty, to join with the United States in the construction and control of any canal which might be constructed uniting the waters of the Atlantic and the Pacific. The negotiations were conducted by John Hay, Secretary of State, on the part of the United States, and by Lord Pauncefote, British minister to the United States, on the part of Great Britain. According to the original treaty, the United States agreed to unite with Great Britain in guaranteeing the neutrality of the canal, and to invite other nations to join in this guaranty. The latter provision aroused a great deal of opposition in America, and the treaty was accordingly amended by the U. S. Senate so as to leave with the United States alone the right of maintaining the neutrality of the canal. The treaty, as thus amended, was rejected by Great Britain, March 11, 1901. A new treaty was then negotiated (signed Nov. 18, 1901), providing for the abrogation of the Clayton-Bulwer treaty, and assuring to the United States sole control of the canal, and sole right of maintaining its neutrality. The United States, on the other hand, engaged to adopt substantially the same rules governing the equal rights of all nations in the navigation of the canal as govern the navigation of the Suez Canal. In this form the treaty was acceptable to Great Britain, and it was ratified by the U. S. Senate on December 16, 1901.

**Hays, Will H.** (1879- ), politician and moving picture executive, began his career as a Republican county chairman in Indiana and rose to the national chairmanship of his party. Appointed Postmaster-General by President Harding in 1921, he left the Cabinet a year

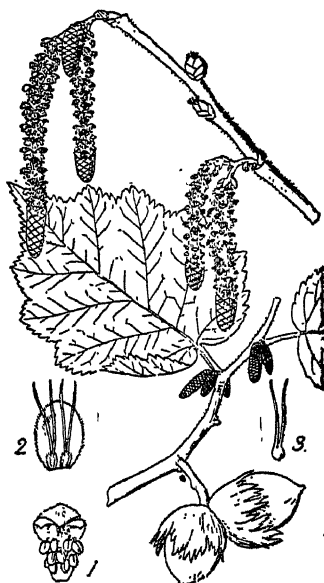
later to become president of the Motion Picture Producers and Distributors of America.

**Haywood, William Dudley** (1869-1928), American labor leader, was born in Salt Lake City; he worked in mines at age of 15; rose to leadership of Western Federation of Miners. He led textile strikes (1904-14); sentenced in 1917 to 20 years' imprisonment; escaped and fled to Russia.

**Hazáras**, a tribe who occupy the Taimani highlands between Kabul and Herat in Afghanistan, some of their villages being situated at from 5,000 to 10,000 ft. above sea-level. They are of Mongol origin, and there are two main sections—the Aimaks, rigid Sunnis, in the w., and the Hazáras proper, Shiahs, in the east.

**Hazard**, a game with dice, formerly popular in England.

**Haze**, an obscuring of the atmosphere due to the presence of countless minute particles. It is generally produced by dust and, unlike fog, usually occurs when fine, dry weather prevails.



*Hazel (Corylus avellana).*

1, Scale, male catkin, with anthers; 2, Upper scale, female; 3, Pistil.

**Hazel (Corylus)**, a genus of small trees or shrubs of the family Betulaceæ, including a number of North American and European species. They bear rough, nearly circular leaves, yellow male catkins, and tiny crim-

son female flowers, which are followed by the fruit in the form of the well known hazelnuts. There are three species in North America. Most of the cultivated varieties of hazelnuts are known as filberts.

**Hazlitt, William** (1778-1830), English critic and essayist. In 1798 he formed an acquaintanceship with Coleridge and under his influence wrote an *Essay on the Principles of Human Action*, published in 1805. In 1812 he settled in London, but was little known until 1817, when he brought out *Characters of Shakespeare's Plays*, and *The Round Table* (with Leigh Hunt) containing the best of his essays. In 1818 he delivered his *Lectures on the English Poets*, in 1819 *Lectures on the English Comic Writers*, and in 1820 *Lectures on the Dramatic Literature of the Age of Elizabeth*. In 1821-2 he published *Table Talk*, in 1825 the *Spirit of the Age*, a series of portraits of contemporaries, and in 1826 *The Plain Speaker*. His last three years were devoted to a *Life of Napoleon*, of whom he was an ardent admirer (1828-30). Consult his *Literary Remains* (2 vols. 1836); *Sketches and Essays* (1829); *Winterslow Essays and Characters Written There* (1850); *Memoirs of William Hazlitt*, by W. Carew Hazlitt; and the *Collected Works*, ed. by A. R. Waller and Arnold Glover, with introduction by W. E. Henley.

**Hazlitt, William Carew** (1834-1913), English man of letters, bibliographer, and numismatist, grandson of William Hazlitt. Among his principal works may be mentioned *Memoirs of William Hazlitt* (1867); *Hist. of the Venetian Republic* (1867; 3rd ed. 1900); *Bibliographical Collections and Notes* (1876-1904); *Dodsley's Old Plays* (1874-6); *The Lambs* (1897); *Shakespeare* (2d ed. 1903); *Montaigne's Essays and Letters* (1902); and *Our National Faiths and Customs* (1904).

**Head.** In all vertebrates, Chordates, above amphioxus a distinct head region is present; or in other words, the anterior part of the nervous system becomes distended to form a specialized region, the brain, and this brain is surrounded and protected by a cranium—hence the name of Craniata, applied to all vertebrates with a head. In the higher Craniata the cranium becomes a dense bony case, the skull; but in lower forms it may be a simple trough of cartilage or gristle. The head is a segmented structure, but the skull is not.

**Head, Sir Edmund Walker** (1805-68), born near Maidstone, Kent. From 1854 to 1861 he was governor-general of Canada.

**Headache.** Any variety of pain in the head not confined to the tract of any particular nerve. Headaches are described according to their nature, as throbbing, aching, shooting; or according to their site, as brow, frontal, vertex or occipital; or according to their cause. Headache is a symptom either of a functional nerve disorder, of organic disease, of intoxication, from tobacco, alcohol, lead, of infection, of disturbances of circulation, or from injuries, fatigue, rheumatism, or gout.

By far the greatest number of headaches is due to neurasthenia, and the next frequent cause is digestive disturbance. Next in frequency comes eye-strain, and then toxins from such diseases as syphilis, gout, rheumatism, nephritis, and fevers. Pains in the head which are confined to the tract of a particular nerve are not properly classed as headaches; they are neuralgias or attacks of migraine. Tic douloureux is a neuralgia of the fifth cranial nerve, which is characterized by severe twinges of pain arising generally in the side of the nose or upper lip, and passing to the teeth, eye and temple, brow and side of the head. Migraine is a constitutional nerve disorder characterized by periodic pains affecting the fifth and other cranial nerves, as well as certain sympathetics. Treatment of headache depends upon the cause, and no other symptom requires as much careful inquiry into its cause as headache. Many powerful drugs, some of them dangerous, are used to treat the causes of headaches. The physician must decide what drug is to be used by the patient for recurring headaches.

**Head-hunting**, the practice—now, however, dying out—among the Dyaks of Borneo, natives of Philippine Islands, and other Eastern tribes, of obtaining and treasuring up the heads of their enemies. See Dorothy Cator's *Everyday Life among the Headhunters* (1905), and A. C. Haddon's *Head-hunters, Black, White, and Brown* (1901).

**Headley, Joel Tyler** (1813-97), American historian, was born in Walton, N. Y. He wrote *The Adirondacks, or Life in the Woods* (1849), *Washington and His Generals* (1847), *The Achievements of Stanley and Other African Explorers* (1877).

**Healey, George Peter Alexander** (1808-94), American portrait painter, was born in Boston. His 'Webster's Reply to Hayne,' 1851, which includes 130 portraits, is well known through reproductions; the original is in Faneuil Hall, Boston. He also did portraits of many of the presidents of the United States.

**Health.** By detailed comparison among organisms of the same species a standard is fixed as an indicator of the average of function and balance of functions. This standard is the 'normal.' The usual form of the maintenance of the normal in each function and in the total functions constituting the organism is health. See PUBLIC HEALTH, SANITARY SCIENCE, PHYSICAL TRAINING.

**Health, Bill of.** See Bill of Health.

**Health, Board of.** An administrative department of government instituted for the regulation of the sanitary conditions of life. Such boards, established under the authority of the state legislatures, exist in all of the United States. The jurisdiction of such boards may extend to various matters as the regulation of quarantine, the prevention of food adulteration, the control of hospitals and asylums, the suppression of public nuisances, the drainage of marshes, the destruction of the mosquito pest, the scientific investigation of contagious diseases, etc. See QUARANTINE.

**Health, Public.** The United States Public Health Service is a bureau of the Treasury Department under a commissioned medical officer bearing the title of Surgeon General. Its functions are: (1) to prevent the introduction of disease from without; (2) to examine arriving aliens; (3) to suppress epidemics; (4) to cooperate with state and local departments; (5) to investigate diseases; (6) to supervise and control biological products; (7) to provide public health and information; (8) to maintain marine hospitals and relief stations; (9) to provide medical service in Federal Prisons.

At the National Institute of Health, Washington, research work in the field of disease, sanitation and water pollution is carried on, and tests are made of various serums and toxins, for the supervision of the manufacture and sale of which the Public Health Service is responsible.

**Healy, Timothy Michael** (1855-1931), Irish barrister and first Governor-General of the Irish Free State, 1922-1927, was born at Bantry. Among his publications are: *A Word for Ireland* (1886); *Leaders and Letters of My Day* (1927).

**Hearing.** Sound waves impinging on the somewhat cup-shaped tympanic membrane of the ear set it into vibration. The vibrations are communicated to the 'canal of the cochlea,' within which lie the terminations of the nerve of hearing.

Sound sensations include noises, which are due to irregular sound vibrations; musical

tones, which are due to regular vibrations; pitch, which varies according to the velocity of the vibrations; harmonic intervals, which result in the blending of two or more tones, the vibrations in one tone being a multiple of those in the other; beats and dissonance, which result when of two tones sounded together the vibrations of the one are not an exact multiple of the vibrations of the other; difference tones, incidental tones that occur when two notes within a scale are sounded together; timbre, which is the difference in quality between a note of given pitch sounded on different instruments or by different voices, the difference in quality being due to differences in the overtones, while the fundamental tone remains the same. The perception of distance and direction of sounds are not a primary instinct; it is acquired by experience, and does not depend on sound alone. Unlike the lower animals, man derives from the external ears practically no assistance in localizing sounds. See EAR, SOUND, ACOUSTICS.

**Hearing.** In general any judicial proceeding, whether in a formal litigation or not, and whether in open court or before a referee or a legislative or other commission with judicial powers. Technically the term denotes a proceeding in equity corresponding to a trial at law.

**Hearn, Lafcadio** (1850-1904), gifted American author, was born in the Ionian Islands. After being educated in England and living in the United States, he went to Japan, where he was naturalized under the name of Yakumo Koizumi, and was a teacher in the university of Tokyo. His works include *Glimpses of Unfamiliar Japan* (1894), *Out of the East* (1895), *Japanese Inner Life* (1897), *Shadowings* (1900), *A Japanese Miscellany* (1901), *Kotto* (1902), and *Kokoro* (1905).

**Hearsay Evidence.** Evidence of an occurrence which did not come under the personal observation of the witness testifying thereto.

**Hearst, Phoebe Apperson** (1840-1919), American philanthropist, mother of William Randolph Hearst of New York. She devoted a large fortune to promoting educational work by establishing and maintaining kindergartens, manual training schools, working girls' clubs, free libraries, Egyptological exploration, College for Kindergartens, Washington, D. C., and a mining building at the Univ. of Cal., as a memorial to her husband; provided funds for an international architectural competition for plans for enlarging the Univ.

**Hearst, William Randolph** (1863), American journalist born in San Francisco, Cal. He became editor and proprietor of the San Francisco *Examiner* in 1886. In addition to the New York *Journal* and *American*, he published newspapers in San Francisco, Los Angeles, Chicago, Atlanta, Baltimore, Boston, Madison, Washington, Albany, Syracuse, Rochester, Pittsburgh, Detroit, Seattle, Oakland, San Antonio and Omaha. He also published magazines both in the United States and in England. He was representative in Congress in 1903-07, unsuccessful candidate for the Presidential nomination in 1904, for mayor of New York in 1905, and for governor of N. Y. in 1906. In recent years he has disposed of some of his publications, and consolidated others which in 1939 were in hands of trustees.

**Heart.** A heart is possessed by only some invertebrates, and in none does it attain a high degree of complexity. Unlike the same organ in vertebrate animals, the invertebrate heart always contains pure blood, and is systemic in function—it drives pure blood to the body, and is unconcerned with the propulsion of impure blood to the breathing organs.

In man the heart is a hollow, muscular organ of conical form, the apex being directed downwards, forwards, and to the left side. It is situated in the anterior part of the thoracic cavity, behind the sternum and between the lungs, being, in the adult, about 5 in. long,  $3\frac{1}{2}$  broad, and  $2\frac{1}{2}$  thick. It is divided by an impermeable, fibrous, mesial septum into right and left sides, and each half is further subdivided by a septum with a valvular aperture into an auricle, or receiving, and a ventricle, or propelling chamber. While each of these four chambers is of about the same cubic capacity, they vary considerably in the thickness of their muscular walls. The auricles, having comparatively little work to perform, are relatively thin-walled; the muscle of the right ventricle is thicker, since it must propel the blood through the pulmonary vessels; that of the left ventricle is still larger and more powerful, its function being the propulsion of the blood throughout the whole body. Between the right auricle and the right ventricle lies the tricuspid valve, whose three segments are so arranged that, while they allow the blood to pass freely from auricle to ventricle, they prevent its return when the ventricle contracts. The only other opening in the right ventricle is that of the pulmonary artery, into which the blood is therefore

forced by the ventricular contraction. This orifice also is provided with a valve, acting similarly to the tricuspid. On the left side of the heart the arrangement is almost identical. The left auriculo-ventricular opening is guarded by a valve of two segments; and it borrows its name, mitral, from its supposed resemblance to an inverted mitre. The valve is comparable to the tricuspid, in that it prevents regurgitation of blood into the auricle when the ventricle contracts, so that the systole of the left ventricle compels the blood to pass into the only available passage, the aorta. The aortic opening, like that of the pulmonary artery, has a valve of three segments, which has for its function the prevention of backward flow when the left ventricle again dilates. The pulsations of the heart are rhythmical, each consisting of (1) a simultaneous contraction of the auricles, and (2) a simultaneous contraction of the ventricles. These two contractions constitute the systole. Then follows a pause or state of rest, during which the muscle relaxes and all the chambers dilate. This is known as diastole, and occupies nearly as much time as the two contractions together. Systole and diastole make up the cardiac cycle.

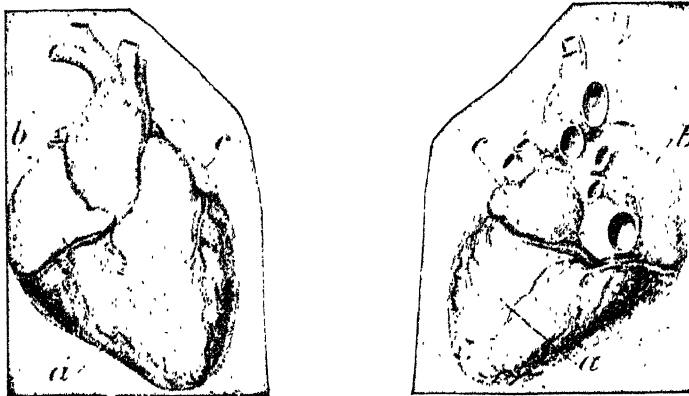
The muscle of the heart is of the involuntary type, but among muscles of this variety it is unique in being striped. It is under the control of cardiac nerves, which are derived from the cervical ganglia of the sympathetic nervous system, and its movements are therefore independent of volition. Externally the heart is covered by the pericardium, a dense fibrous mantle arranged in two layers, which enclose between them the pericardial cavity. The outer layer is in the form of a pyramidal tent pitched upon the diaphragm. The apex of the tent falls downward within the walls, so as to form a pouch in which the heart lies. The infolding of the outer layer takes place where the great vessels spring from the heart. The inner surface of the inner pericardial layer is firmly adherent to the heart muscle, and that part of the diaphragm embraced within the circle of the tent has adherent to it a continuation of the outer layer, which, as it were, forms a floor to the tent. To each other the outer and inner layers of the pericardium present smooth, glistening, serous surfaces, which secrete a small quantity of thin pericardial fluid that acts as a lubricant, and, by diminishing friction, facilitates the cardiac movements. Internally the heart chambers are lined by the endocardium, whose serous surface in a similar way lessens

the friction between the moving blood and the muscular walls. The valve segments are semilunar in shape, and are composed of folds of endothelium strengthened by enclosed fibrous tissue.

**Heart, Artificial.** For a hundred years physicians and engineers have been wrestling with the problem of keeping living organs alive after they have been removed from the body. In 1931, Charles A. Lindbergh, famous aviator working under the direction of Dr. Alexis Carrel, famed surgeon and Nobel prize winner, designed a germ-free pump consisting of a coiled glass tube, whose top and bottom ends are connected by a

The immediate importance of this machine has been that it enables experimenters to study the reactions of individual organs and to watch the curative effect of various medicines on these organs. It is also possible at present, by the use of this glass heart, to prepare and draw off hormones produced by active glands as rapidly as they are produced. Since these hormones have been very difficult and expensive to obtain, either for curative or for experimental purposes, their production has been very important.

**Heartburn,** a popular name for pain or discomfort caused by irritation of the stomach.



*Human Heart, Anterior and Posterior Views.*

straight piece of glass tubing. Liquid can be sealed within this tube in such a manner as to eliminate all germs and still allow for the passage of gases into the tube. A wobbling motion is then imparted to the tube, and it acts as an effective pump. In 1935 this pump apparatus was perfected so that organs such as the heart, the kidneys, the glands, etc., could be attached to it; and by circulating the proper liquid, introducing the proper mixture of gases, and keeping the organs and apparatus at the proper temperature in a germ-free atmosphere, these organs could be kept alive for their normal life span although entirely separated from the body.

The gas mixture found most successful for this purpose consists of 47 percent nitrogen, 40 percent oxygen and 3 percent carbon dioxide. It is introduced into the apparatus at regular intervals, thus simulating the normal action of the heart. In 1936 Dr. Carrel's laboratory discovered a satisfactory substitute for real blood. Healthy organs can be kept alive and growing by this means.

**Hearth-money,** a household tax originally imposed in Anglo-Saxon times in England, and re-imposed after the restoration, 1662, to take the place of certain of the old subsidies which were abolished during the protectorate.

**Heart's Content,** seapt. tn., Newfoundland; is the terminus of three Atlantic cables; p. 1,079.

**Heart's-ease.** See Pansy.

**Heart-seed.** The fruit of a genus of tropical vines, *Cardiospermum*, of the horse-chestnut family.

**Heat.** When we use the words hot and cold, we implicitly regard ourselves as the standard of comparison; but if we try to form a scale of degrees of hotness, and classify substances accordingly, we soon encounter difficulties. Hence the necessity for the introduction of the scientific term temperature to express the relative condition of bodies as regards the transference of heat from one to the other. Thus, when bodies are at the same temperature, there is no transference of heat from one to the other. On the other hand,

when there is a transference of heat, there must be a difference of temperature, and the heat passes from the body at the higher temperature to the body at the lower temperature.

In order to determine which of two bodies is at the higher temperature, we require some method of indicating whether a body is losing or gaining heat. For this purpose we appeal to some measurable physical quality which alters in a definite manner when heat is given to or taken from the body; and the particular quality most commonly made use of is the volume of a fluid. It is by means of this increase of volume in the case of the fluid mercury that we usually indicate and measure rise of temperature. Any instrument which indicates change of temperature by the measured change of some physical quality is called a thermometer.

If we place a thermometer in a mixture of ice and water, we find that the mercury column always stands at the same height. When we apply heat to the ice and water and keep the mixture well stirred, the mercury column remains still at the same height, and not until the ice is wholly melted will the mercury begin to ascend as heat is applied to the water. By a similar experiment we may prove that the steam which comes off from boiling water at a given atmospheric pressure has always the same temperature—the temperature, namely, of boiling water; and the application of heat to this boiling water will produce no rise of temperature. These experiments give us two definite temperatures which may be reproduced at any time, and they therefore form convenient standard temperatures on which to base a scientific thermometric scale.

The fact that heat is used up in changing a solid into a liquid and a liquid into a gas gives a clue as to the real nature of heat. For these states of a substance differ from one another in the degree of mutual constraint of the particles or molecules which compose the substance. The gaseous molecules have greater energy of motion than the liquid molecules, and these, again, greater energy than the molecules in the constrained solid state. Hence the absorption of heat, say, in transforming a pound of boiling water into steam is accompanied by an increase in the energy of motion of the molecules. Energy has appeared in the form of motion of masses; it has disappeared in the form of heat. Heat, in short, is energy.

The most familiar method of producing

heat is by combustion, a process which involves chemical action, with the formation of a new compound substance. A simpler case is the production of heat by friction or concussion. In these cases we know that work has been done in overcoming the frictional force, or that energy of motion has been lost by the impact of one body on the other. With a delicate thermometer there is no difficulty in demonstrating that two pieces of wood rubbed briskly together become raised in temperature. The method is used by uncivilized peoples to generate fire. The heat produced at the axles of wheels is another illustration. In brief, whenever mechanical energy is lost to a system, a certain amount of heat is always produced; and there is a definite relation between the mechanical energy lost and the heat produced. This great truth was established by Joule, who proved that the amount of heat required to raise a pound of water  $1^{\circ}$  F. in temperature was equivalent to 779 foot-lbs. of work. This number is called Joule's dynamical equivalent of heat. When we try to reverse the process, and change a given supply of heat into mechanical work, we find that the heat must pass from the body at the higher temperature to the body at the lower temperature. Thus, in the steam-engine there must be a boiler and a condenser at different temperatures. Now, in the best possible engine some of the heat supplied by the boiler must be given to the condenser; hence only a part of the heat supplied is available for transformation into useful mechanical work. It was this fact which led Lord Kelvin to his definition of absolute temperature, or rather, to the definition of a *scale* of temperature depending only upon energy relations, and quite independent of the properties of any special thermometric substance, such as mercury, etc. When as much work as is theoretically possible is being obtained from a heat-engine working between given temperatures of boiler and condenser, the temperatures of these bodies are defined to be in the ratio of the heat given up by the boiler to the heat taken in by the condenser during any complete cycle of operations. See also THERMO-DYNAMICS.

Another way of stating this fact is in the form of a law—that the product of the pressure and volume of a gas is proportional to the absolute temperature. Were the gas to retain the same properties down to the lowest temperatures, its pressure or volume, or both, would vanish at the absolute zero. But so far as our knowledge goes, the sub-

stance ceases to be a gas before the absolute zero is reached. When, by the abstraction of heat from a gas and the increase of pressure, the substance becomes either liquid or solid, the density is greatly increased, and the particles of the substance are brought much closer together. This is true not only of substances which are gaseous at ordinary temperatures, but also of substances—such as iron, sulphur, or mercury—which are solid or liquid at ordinary temperatures. The difference is one of degree, not of kind. In all cases, the lower the temperature, the further removed from the gaseous state, or the nearer the solid state; and the higher the temperature, the further removed from the solid state, or the nearer to the gaseous state. Now, when the substance is changing state from solid to liquid or from liquid to gaseous, the heat supplied is not increasing temperature, but is being transformed into molecular energy. When, however, the substance is not changing state, the addition of heat in general means a rise of temperature. In the case of a solid such as iron the temperature may rise to such an extent as to make the substance self-luminous. Moreover, long before it is giving out rays of light it is emitting non-luminous rays of so-called radiant heat. (See RADIANT ENERGY.) In the case of highly-heated gases a few rays of definite wavelength are given off (see SPECTRUM), showing that the particles vibrate freely in a few simple modes of vibration.

All these facts go to show that rise of temperature is associated with increased energy of vibration of the molecules which constitute the substance. And thus we come to recognize heat as the energy of molecular vibrations. Every molecular group is in a state of agitation, and is capable of communicating similar motions to neighboring groups. This, no doubt, is the process by which heat is conducted through a substance.

The tendency of heat is to pass from the body at the higher temperature to the body at the lower temperature; and there is no material known which is able to act as a perfect non-conductor. Thus, it is impossible for a region to remain indefinitely at a higher or a lower temperature than surrounding regions. Herein is found the great difficulty of obtaining either a very hot or a very cold body.

The highest artificial temperatures are now got by means of the electric furnace; but to sustain these high temperatures, a great amount of energy is lost by the processes of

conduction, convection, and radiation. In like manner, to reach very low temperatures a large amount of work must be done in compelling physical changes which produce a great absorption of heat. The cooling effect due to an imposed physical change may be illustrated in various ways. The simplest is perhaps the cooling due to evaporation. Evaporation means the transformation of a liquid into a vapor, in which form the particles have a greater energy of motion.

Similarly, when a gas is allowed to expand suddenly into a partial vacuum, the work done by the expanding gas means an absorption of energy. The gas itself loses energy in the form of heat, and the temperature falls. It is by a skilful use of these two methods that experimenters have in recent years obtained temperatures low enough for the liquefaction of air, oxygen, and hydrogen. Essentially the same in principle is the action of freezing mixtures. A physical state is induced which requires absorption of energy, and this is accomplished at the expense of heat in the substances forming the mixture.

**Heather, or Heath,** the common name for the plants belonging to two genera of the order Ericaceæ.

**Heating.** Among the ancient Romans it was customary for the poorer classes to build fires upon a stone or brick floor located at one side or end of a room, the smoke and soot passing out of the room through holes in the roof. The wealthier class used braziers, and carefully dried wood was burned. Our forefathers used the open fireplace 6 or 8 ft. in length to accommodate the large logs of wood which were used for fuel. After coal could be purchased, smaller fireplaces were constructed. In either case a large proportion of the heat obtained escaped up the chimney.

As the country grew in population and larger buildings were erected, it became necessary to provide some other form of heating apparatus. To this end the Franklin stove was designed, followed by later styles, improved to provide better combustion and to prevent loss of heat. To save the labor of carrying fuel and ashes for many fires, the idea of centralizing the heating apparatus and of warming several rooms from one fire was conceived, leading to the adoption of the inclosed stove, with tin or sheet-iron pipes to convey the heated air to each separate room. From this arrangement developed the modern furnace. Experiments were next conducted with heated water and steam as a means of conveying heat from a central point to



various parts of a building, methods of heating which have been carried to a high degree of development. Later developments are vapor, gas, and oil heating.

A radiator heating system consists of a boiler, piping, radiators, and accessories. The function of the boiler is to provide for the combustion of a solid, liquid, or gaseous fuel, and to transfer as much of the heat as possible from this combustion to a surrounding body of water. The heat absorbed by this body of water is then conveyed by the circulation of the water itself or by the steam generated therefrom, through the system of piping to the radiators, which are located in different parts of the building. The radiators warm the rooms in which they are installed by heating and circulating the air that comes in contact with them. After it has given up most of its heat, the heat-conveying medium in the radiator returns to the boiler to be reheated and again circulated. The modern heating boiler has been highly developed as the result of many years' experience in construction and installation.

The fuels generally used in heating boilers are anthracite or hard coal, bituminous or soft coal, coke, oil, and gas.

Radiators are made in a wide range of shapes and styles. Cast iron has been found the most suitable material, for although requiring more time to heat than copper, it retains heat longer and is more durable. To figure the radiation required for any given room it is necessary to take into consideration the glass and wall exposures, as well as the cubical contents.

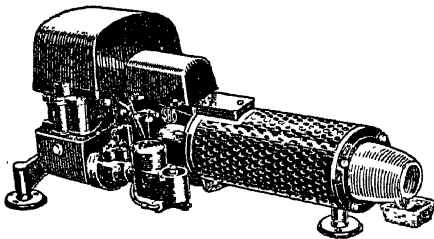
The early method of heating by steam was with what is commonly known as the two-pipe system; the steam being conveyed to the radiators, or heating units, through one series of pipes and the water of condensation returned to the boiler through another series, called returns. Pipes of small size were used, and a high pressure of steam was maintained. As the knowledge of steam heating increased, larger pipes and lower pressures were employed. The one-pipe system is now in common use; it is simple in design, easily installed, and requires a limited amount of pipe and fittings. The steam main or mains (there may be more than one) pitch downward from the boiler. The supply riser is carried above the boiler to such a height as circumstances will allow and from this point there is a gradual pitch of at least one-half inch in each ten feet of length to the end of the main. After the last branch to a radiator has been con-

nected from it, the main is reduced, usually two pipe sizes, to form the dry return, which is brought back to a point near the boiler where a drop is made and the pipe connected into a return opening in the boiler. Automatic air valves at the elbow at the end of the dry return will quickly free the main of air when steam is generated in the system, thus permitting all radiators to receive their supply of steam at practically the same time.

In the year 1716 in Newcastle-on-Tyne, England, a method of warming greenhouses by hot water circulation was tried and a few years later hot water in circulation was used in France for warming a chicken hatchery and brooder. In the early part of the last century the system was developed to make it practical for use in warming buildings. It did not come into general use in the United States, however, until 1875-85. The system consists essentially of a boiler to which the heat is applied and to which are connected pipes and radiators. In the hot-water heating system, the hot water, as it comes out, outweighs the warmer water in the heater, causing it to rise in the system and circulate through the piping and radiators, the difference in the mean temperature of the water as it ascends and descends in the system keeping the circulation constant. The greater the height of the return pipe (in which the cooler water is descending), the more energy and push against the warmer water in the heater, and consequently the more rapid the circulation.

A vapor-heating system is a steam system provided with special equipment for removing air, so that the water in the boiler will steam at a considerably lower temperature than at atmospheric pressure. Radiators of the hot-water type are used with a supply valve, by which the steam supply can be so controlled that only the amount required to heat the room is admitted to the radiator, and with return connection which carries off both the air and condensation. The steam flows into the successive sections of the radiator at the top and fills them through part or all of their length, depending upon the degree of valve opening. The surface of the part of the radiator which is filled with vapor is at nearly steam temperature. The remainder of the surface is warmed by the condensation, which trickles down the inside surface, the temperature decreasing toward the bottom. The temperature of the discharged condensation is thus materially lowered, an advantage from an economic standpoint in cases where the condensation is not returned to the boilers.

In the vapor system there is normally no steam in the return lines. They carry both the air and condensation from the radiators and are often open to the atmosphere. The steam is prevented from flowing from the radiators into the return line by means of a device installed on the return end of the radiator, and by limiting the maximum area of opening of the inlet valve so that at no time will more steam be supplied to the radiator than can be condensed in it. Since the steam and water flow in separate systems of piping, there is no opportunity for noises or 'water hammer,' as it is technically called. The air is discharged into the basement and this eliminates the noise, smell, and drip which accompany the action of the ordinary air valve. The vapor-vacuum system or three-in-one method of heating is a modified system, so designed and installed that it may be operated at low temperatures as a vapor or vacuum system or, if desired, under a moderate steam pressure in extremely cold weather.



*Automatic Controlled Draft Oil Burner.*

While oil has been used for fuel for over twenty years, its use for domestic purposes has been comparatively recent. Oil heating simply substitutes oil for coal, coke, or other fuel. The same type of heating plant is used, and old plants are readily converted for the use of oil. The oil burner is attached to the furnace or boiler, and supplies a hot flame which corresponds to that given by coal. The installation consists of a storage tank, a connecting pipe from the tank to the burner, and necessary controls for regulating the flame either manually or automatically. The automatic burner requires a thermostat, which stops or starts the burner as the temperature of the room rises above or falls below certain points. Oil burners are of two types: gravity natural-draft burners and automatic controlled-draft burners. One form of automatic control burner draws the oil to itself by means of a pipe which permits the oil tank to be

placed on a level below that of the burner, and thereby overcomes any danger of leakage. After reaching the burner, the oil passes into a constant level float so that the flow is always uniform. It is then drawn up to an atomizing device, where it is mixed with air, and is thrown in the form of a fine mist into the combustion tube. A spark terminal ignites the oil, and preliminary combustion takes place. A secondary air carries the flow out of the tube into the furnace where final combustion takes place. The air used in the first stage is secured from a small compressor; the secondary air is provided by a fan.

Most automatic burners are protected with safety devices to insure proper operation. The principal device is the thermal unit in the combustion chamber, which contracts whenever the flame is diminished or goes out. The contraction causes a shortening of a rod which opens a circuit and stops the burner motor. Some oil heaters are regulated by a thermostat in the living room, or other convenient place. This is set for the temperature desired and when this is reached the burner automatically stops.

Gas heating is recommended by its flexibility, the rapidity with which it responds to demands for heat, and its ease of regulation applied. The modern gas boiler has a number of burners which can be controlled manually or by automatic controlling devices, which shut off the supply when the temperature or pressure reaches a certain point. Gas boilers are adaptable to steam, vapor, or hot-water heating systems. The gas supply to the boiler is automatically controlled by the steam pressure in steam and vapor systems and by the temperature of the water in hot-water heating. In many gas-heating systems safety devices are provided to prevent accidents. Gas boilers were first generally used in the natural gas districts, but their use has spread rapidly to districts using manufactured gas and in many cities gas companies offer special rates for heating and supervision.

The use of electrical energy as a substitute for coal in house heating is popular in certain sections of the country where water power is abundant. The method of electric heating is by an electric steam radiator. Pipes and heaters are not required, and a single filling of water is the only attention needed for a year of service, since in this time the loss from evaporation is less than a half pint of water. The radiator is controlled by a three-heat electric switch, high, medium, or low, for the amount of warmth desired. Being portable it

may be moved from room to room and stored when not needed.

**Heat of Formation.** When chemical compounds are formed from the elements, heat is evolved, the quantity being very large in such cases as combustion, small in others. All chemical reactions involve heat changes, some releasing and others absorbing heat. The quantity is determined by carrying out the reaction in a calorimeter, so that a known mass of water is heated, the product of the mass of water into its rise of temperature giving the quantity of heat received.

**Heaton, Augustus George** (1844-1930), American artist and poet, was born in Philadelphia. His paintings include *Washington's First Mission*; *The Recall of Columbus*, bought by the U. S. Government and used on the 50-cent stamp of the Columbia series; *Promoters of the New Congressional Library*; *Hardships of Emigration*, used by the United States Government on the 10-cent stamp of the Omaha Exposition; *Icebergs*; and a number of portraits. His literary works include *A Treatise on the Coinage of the United States Branch Mints* (1893); *Yellowstone Letters* (1906).

**Heaton, Sir John Henniker** (1848-1914), British public official, was born in Rochester, Kent. He was greatly interested in the postal service and secured many reforms, chief of which were the initiation of penny postage throughout the British empire, the adoption of penny postage between the United States and England, the parcel post to France, and telegraphic money orders. His published works include *A Short Account of a Canonization at Rome*; *Australian Dictionary of Dates and Men of the Time* (1879).

**Heat-stroke.** See **Sunstroke**.

**Heaven**, the expanse of space above the earth, popularly conceived as the place of supreme bliss, the abode of God, the angels, and of men made perfect. In the Greek and Roman religions heaven is the dwelling place of the higher gods; but the place of reward for good men is usually placed somewhere upon or beneath the earth. Not even in the Hebrew Scriptures is heaven regarded as the ultimate home of the godly. *Shamayim* (a dual form) signifies the upper half of the world—that atmospheric region, and the firmament in which the sun, moon, and stars move; it is the high and holy place where God dwells. In the New Testament the idea of locality recedes more and more into the background, though it does not entirely disappear: thus, Christ is received up into heav-

en, but heaven becomes increasingly a spiritualized conception; it is the supramundane state of realized aspirations, transfigured lives, and abundant recompense, in which the ransomed see God, who is the sum and center of its felicity. It is doubtful if the notion of a plurality of heavens is in the legitimate line of Jewish or Christian thought. See **PARADISE**; **VALHALLA**.

**Heavy Water** ( $D_2O$ ), is composed of the heavy isotope of hydrogen ( $D$ ) and oxygen. It is 10% heavier than water, boils at  $214\frac{1}{2}^\circ F$ . It has been found in the Dead Sea, Great Salt Lake, sap and wood of willow trees, borax deposits. The first cost of manufactured  $D_2O$ , \$150 per gram, has been considerably reduced. See also **HYDROGEN**, **CHEMISTRY**.

**Hebe**, in Greek mythology, the daughter of Zeus and Hera, was the goddess of youth, and waited on the gods as cup-bearer before Ganymede.

**Hebrew Language, The**, the original language of the Old Testament and of several books of the Apocrypha, is one of the Semitic family of tongues, belonging to the middle or Canaanite branch, and differing only dialectically from Phœnician and Moabitish. Hebrew has, in common with the other Semitic languages, the following distinctive features: the vast majority of its roots have three consonants; its inflection consists in internal change of words much more than in Indo-Germanic languages; its verbs have two tenses only—perfect and imperfect; except in proper names, it does not form compounds; its syntax is simple and primitive, the prevailing clause-construction being a succession of simple sentences joined together by the particle *we*, 'and.' It is written from right to left, and originally employed an angular script, still seen in the Moabite stone and the Siloam inscription, which, however, gradually gave way to the square character now used in printed Hebrew Bibles.

The ancient literature of which this language is the vehicle is comprised entirely in the Old Testament. Now as the Old Testament represents a literary activity of nearly a thousand years, it is but reasonable to suppose that the language of the earlier works would be considerably different from that of the later; while, on other grounds, the probable existence of local dialects might be expected to show itself in diversity of diction among the various books. But neither of these surmises can be said to find much verification in our extant Hebrew text. The most

ancient documents and the youngest are remarkably similar in the general cast of their language, and certainly show nothing corresponding to the difference between Homer and Plato, or Chaucer and Shakespeare; yet all attempts to distinguish dialects in our extant books have failed. This remarkable uniformity is best explained by the hypothesis of a continuous process of revision and modernizing of the documents, which may have gone on till well into our era. Still, in spite of this levelling tendency, there remain certain diversities, particularly in the vocabulary, which have not been eliminated, and these serve to distinguish two great periods in the history of the language, sometimes called the golden and silver ages respectively, roughly separated by the return from the exile. To the former belong, without doubt, the older strata in the Hexateuch, and the greater prophets, to the latter, almost as indubitably, Chronicles-Ezra-Nehemiah, Ecclesiastes, and Daniel, all of which use a considerable admixture of Aramaic or Persian words, and therefore belong to the period when the language of the Jews was gradually giving way before that of their Aramaic-speaking neighbors. In course of time the use of Hebrew among the common people completely died out, so that the synagogue readings of the ancient Scriptures had to be made intelligible by an Aramaic rendering—the origin of the Targums. During the middle ages Hebrew continued the language of Jewish religious services, of correspondence, book-keeping, and the like. In the second half of the 18th century a Hebrew revival set in, fostered by Moses Mendelssohn. Since then books and newspapers, letters, and even dramas have been written in ever-increasing numbers in Hebrew (more or less corrupted by the vernacular tongues of the lands where the Jews have dwelt). *Yiddish*, a mixture of bad German and bad Hebrew, originating in Germany and Poland, is to-day the literary language and even the home speech of many thousands, and has a large literature, including many newspapers published in America.

**Hebrews.** See **Jews**.

**Hebrews, Epistle to the**, one of the most important New Testament writings, standing in the English Bible after the Pauline group of letters, and forming what may be called the first literary apology of Christianity. Its all-pervading theme is Jesus Christ and the new dispensation, and its purpose is to make manifest the superiority of these over the representative personages and characteristic

functions of the old order, so that the readers may be preserved against any tendency to apostasy. The writer of Hebrews stands among the highest of the New Testament writers; he has rich diction, philosophic grasp, deep earnestness, and penetrating religious insight, and his theology forms a distinct type to be placed alongside that of Paul and John. Though we may infer that he was a Jew, equally well versed in his own literature and in Greek modes of thought, we have no clue to his identity, except that he was not Paul, though the apostle's name still heads the epistle in the Revised Version. The date of composition is usually placed about A.D. 70, just before the fall of Jerusalem.

**Hebrews, Gospel according to the.** See **Apocrypha, New Testament**.

**Hebrides, or Western Islands**, off the w. coast of Scotland, stretching 200 m. from the Butt of Lewis to the peninsula of Kintyre. The Outer Hebrides are separated from the mainland by the Minch, and from the n. islands of the Inner Hebrides by the Little Minch. The chief islands in the outer group are Lewis-Harris, N. Uist, Benbecula, S. Uist, and Barra. The Inner Hebrides are separated from the mainland by the Sounds of Sleat, Mull, and Jura. The chief islands are Skye, Rum, Eigg, Coll, Tiree, Mull, Staffa, Iona, Colonsay, Jura, and Islay. The islands, in general, are mountainous, rugged, and picturesque. The inhabitants, who use the Gaelic language, mostly combine their labors on land with fishing, and in the outer islands with fowling. Coarse tweeds are a characteristic production, especially of Harris. The Hebrides are the Ebudæ of Ptolemy and Pliny, the Sudreys of the Norsemen, who colonized them in the 9th century. In 1266 the islands were transferred to Scotland, and were for a time held by native chiefs of the hereditary race of Somerled of Argyll; but in 1346 the Macdonald of Islay made himself overlord. Sir Walter Scott and William Black have done much to make the islands familiar to readers. See Mackenzie's *History of the Macdonalds and Lords of the Isles*; Pennant's *Tour in Scotland and Voyage to the Hebrides*.

**Hebrides, New.** See **New Hebrides**.

**Hebron**, ancient city of Judah, Palestine. the modern town of 10,000 inhabitants surrounds the Jewish enclosure over the rock-cut cavern supposed to be the sepulchre of Abraham, Isaac, Jacob, Sarah, Rebekah, and Leah, representing the cave of Machpelah.

**Hecatæus** of Miletus (c. 550-476 B.C.), ancient Greek historian and geographer. His

chief works were *The Circuit of the Earth* and *Genealogies* or *Investigations*.

**Hecate**, a Greek divinity, generally represented as a daughter of Persæus or Perses, was the only one of the Titans to retain her power under Zeus. She was identified with Selene in heaven, Artemis on earth, and Persephone in the nether world, and hence is represented with three bodies or three heads.

**Hecatomb**. See **Sacrifice**.

**Heck, Barbara** (1734-1804), a founder of the Methodist Church in America, was born in Ballingarry, County Limerick, Ireland. She and her husband had been converted by the preaching of Wesley; they came to New York about 1760, and six years later, with Philip Embury, founded the first Methodist congregation in New York city.

**Hecker, Isaac Thomas** (1819-88), American Roman Catholic divine, born in New York city. Received into the Catholic Church in 1845, he was engaged from 1847-51 in mission work in England, being ordained priest by Cardinal Wiseman, 1849. He founded, 1865, and edited till his death, the *Catholic World*. His publications include *Aspirations of Nature* (1857); *Catholicity in the United States* (1879). See *Elliott's Life of Father Hecker* (1891).

**Hecksher, August** (1848-1941), capitalist, born in Hamburg, Germany, and came to the United States in 1868. He was one of the organizers of the Lehigh Zinc and Iron Co., and became general manager of the New Jersey Zinc Co. when it absorbed the Lehigh Zinc and Iron Co. Mr. Hecksher in 1904 became president of the Anahama Realty Corporation, as well as director in a number of other companies. He was also chairman of the Hecksher Foundation for children, and a trustee of Cornell University.

**Hecla Mt.** See **Hekla**.

**Hecla, Cape**, on the n.e. shore of Greenland, the starting point of R. E. Peary in sledge journeys over the ice pack toward the North Pole.

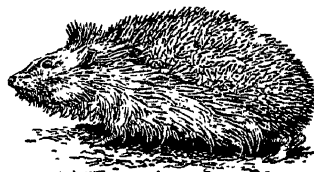
**Hectare**. See **Are**.

**Hector**, champion of Troy in the Trojan War, was the eldest son of Priam and Hecuba, the husband of Andromache, and the father of Astyanax. His chief exploits are his single combat with Ajax, his pursuit of the Greeks to the ships, and his slaying of Patroclus. It was in revenge for this last exploit that Achilles sought him out and slew him, and then fastened his dead body to his chariot and dragged it to the Greek camp.

**Hector, Mt.**, a peak in the Canadian Rocky Mts. Est. height 11,000 ft.

**Hecuba**, the wife of Priam, king of Troy, and the mother of Hector, Paris, and others. After the capture of Troy she was taken captive by the Greeks, and after the sacrifice of her daughter Polyxena succeeded in killing Polymestor, king of Thrace, who had murdered her son Polydorus. Finally she was changed into a dog, and leaped into the sea.

**Hedgehog**. A small insectivorous mammal widely distributed in the northern parts of the Old World, which has the back and sides densely covered with short spines. The neck is short, the black snout shaped like that of the pig, the limbs and tail short. It possesses the power of rolling itself up into a ball on an alarm, so that nothing but the spines are exposed to the enemy.



*Hedgehog.*

**Hedgehog Plant** is a name sometimes given to plants belonging to the genus of leafless, succulent plants known as Echinocactus. The plant is covered with spines or prickles like a hedgehog.

**Hedge-mustard**, a cruciferous plant, with small, yellow flowers borne on upright branches, hairy seedpods and leaves.

**Hedin, Sven Anders von** (1865), Swedish Asiatic explorer, born at Stockholm. His real work as an explorer began in 1893, when he crossed the Pamirs in the depth of winter. In 1895 he crossed the desert of Takla-Makan, and explored the mountain chains around the sources of the Yarkand Daria. Then, after discovering in the sands of Takla-Makan the ruins of an ancient city (Borasan), and traces of Buddhistic civilization, he travelled down the Keriya Daria to the region of Lob-nor. In 1899 he floated down the Tarim, and solved the problem of the Lob-nor. On its ancient northern shore he dug out of the sand evidences of Chinese civilization (houses, wood-carving, mss., etc.) of the 3rd century A.D. The next two years he spent in Tibet. In 1906 he started from Chinese Turkestan for a third journey of exploration in Tibet, traveled 4,000 m., mainly in W.

Tibet, and made valuable discoveries, including the sources of the Brahmaputra and Indus rivers, Lake Chunitso, several mountain ranges, and much unmapped territory. Dr. Hedin took a conspicuous part in the controversy over the separation of Norway and Sweden, holding that an actual rupture was unnecessary. He has published several books.



Sven Anders von Hedin.

(Photo by Elliott & Fry.)

**Hedonism**, the ethical theory according to which pleasure is held to be the chief good. In Greek ethics hedonism was represented by the Cyrenaic and Epicurean schools. In both cases it is the happiness of the individual—the elements of which it is composed and the means of securing it—that the Greek thinkers have in view; although, of course, they are aware, and Epicurus in his doctrine of friendship strongly insists, that happiness is not to be had without a measure of regard for others. In the most important modern form of hedonism, on the other hand, the point of view is from the outset political or social. Utilitarianism aims at the greatest happiness of the greatest number, a collective rather than an individual good, although pleasure is still that in which the good consists. The classical exposition of the modern type of altruistic hedonism is to be found in Mill's *Utilitarianism*, although his argument is generally admitted not to be free from serious inconsistencies. A searching examination of hedonism, both as a method and as a theory, is given by Sidgwick in his *Methods of Ethics*.

**Heel-fly**, a bot-fly common in the w. and s. of the United States, which lays its eggs on the hairs about the heels of horses and cattle, whence they are licked off by the ani-

mal and transferred to the stomach, where the bots develop.

**Heem, Jan Davidsz van** (c. 1603-83), Dutch painter, born at Utrecht, was the greatest master of the flower and fruit painting that the Dutch produced. His draughtsmanship combines decision with all necessary softness, and his coloring sometimes approaches Rembrandt in depth and clearness.

**Hegel, Georg Wilhelm Friedrich** (1770-1831), the greatest German philosopher of the post-Kantian period, was born at Stuttgart. He went in 1801 to Jena, where his friend Schelling, with whose philosophy he was in close sympathy, was professor. Here he was appointed professor; but in the following year everything was thrown into confusion by the war of Prussia with Napoleon and the battle of Jena. In 1808 he produced his second important philosophical work, the *Science of Logic*—the first, the *Phenomenology of Mind*, having already appeared in 1807. In 1816 he was called to a chair in Heidelberg University, and thence in 1818 to Berlin. He now became the recognized leader of philosophical thought in Germany. His *Encyclopædia of the Philosophical Sciences*, produced while he was at Heidelberg, and expanded in two later editions, and his *Philosophy of Right* (1821), complete the list of important works published during his lifetime; but after his death his lectures on *Æsthetics*, *Philosophy of Religion*, *Philosophy of History*, and *History of Philosophy* were published by his pupils.

The system of Hegel is the culmination of the idealistic movement to which the philosophy of Kant gave rise. Reason is the essential nature of reality: 'the rational is the real, and the real is the rational.' It is the business of philosophy to set forth this rationality or truth of experience in a comprehensive and systematic way. His system has three main divisions—(1) the logic, in which the conceptions that underlie experience in its various forms are systematically analyzed and developed by this 'dialectical' method; (2) the philosophy of nature; and (3) the philosophy of spirit or mind, in which the rational structure of the world of nature on the one hand, and of the world of man's individual, social, and spiritual life on the other, is set forth in the concrete. Of the *Logic*, it has been said (by Edward Caird) that it is 'the one work which the modern world has to put beside the *Metaphysic* of Aristotle.' He deals with the great interests of human life, with the organization of so-

ciety and the state, with law and morality, with art and religion. A considerable portion of Hegel's system is accessible in translations: the *Logic* (2nd ed. 1892-94) and *Philosophy of Mind* (1894), from the *Encyclopædia* (by Wallace); the *Philosophy of Right* (Dyde, 1896); *Philosophy of History* (Sibree, 1857); *History of Philosophy* (Haldane, 1892-6). For his life, see Caird's 'Hegel' (1883), in *Phil. Classics*; for criticism, D. G. Ritchie's *Darwin and Hegel* (1893), and R. Macintosh's *Hegel and Hegelianism* (1903).

**Heiberg, Johan Ludvig** (1791-1860), Danish dramatist and critic. In his dramas, *Elverhøi* (1840) and *Alferne* (1835), he is a true romanticist. His Aristophanic comedy, *En Sjael efter Døden*, is a fine satire on the follies of the day. Was one of the directors and ultimately censor of the National Theatre (1849-56), and editor of the famous *Flyvende Post* (1827-30).

**Heiberg, Peter Andreas** (1758-1841), Danish author. He went to Paris, where Napoleon gave him an appointment in the foreign office. He accompanied Talleyrand to Berlin, Warsaw, Erfurt, and Vienna. He wrote songs, comedies, and pamphlets. See Longfellow's *Poets and Poetry of Europe* (1855).

**Heidelberg**, town, Germany, in n. of grand-duchy of Baden; beautifully situated. The glories of Heidelberg are its university and its castle. The university was founded in 1386. The castle, 330 ft. above the Neckar, forms a rude square, with circular towers at the corners, the whole thickly overgrown with ivy. The oldest part of the edifice dates from 1400-10; other large wings were reared in 1556-59, 1601-7, and 1618. Within its walls are preserved the municipal art and antiquarian collections, and a gigantic winecask of a capacity of 46,732 gallons. There is an active trade in books, wine, tobacco, and hops; beer, leather, tobacco, and mathematical instruments are the chief industrial products. From the end of the 12th century down to 1721 Heidelberg was the capital of the Rhenish palatinate; p. 73,034.

**Heidenstam, Werner von** (1859-1940), Swedish author; one of the brilliant masters of style in modern Sweden, and the reviver of the historical romance in that country. His principal work is *Karolinerna* (1897; part Eng. trans. as *A King and his Campaigners*, 1902); besides which he has also written the novels *Endymion* (1889); and *Hans Alienus* (1892). He received in 1916 the Nobel prize for literature.

**Heifetz, Jascha**, (1901- ), violinist. born of Jewish parents in Vilna, Russia. He was graduated from the Royal School of Music at Vilna when he was eight. He then studied under Leopold Auer. He made his debut in 1917 and has played in the leading cities throughout the world.

**Heilbronn**, tn., Württemberg, Germany, on the Neckar. The town has several old buildings—the Deutsches Haus, Götzens Turm, Schönthaler, Hof, the town hall (1540), the church of St. Kilian (1013-1529). Robert Mayer the physicist was born here in 1814. The town has reminiscences of the Emperor Charles v., Götz von Berlichingen, Franz von Sickingen, Georg von Frundsberg, Schiller, and the legendary Käthchen von Heildronn. The ancient mineral spring, from which the town derives its name, ceased to flow in 1857. Heilbronn took an active part in the reformation. Here, in 1633, after the death of Gustavus Adolphus, a conference of various powers determined upon the continuance of the Thirty Years' war; p. 45,520.

**Heilprin, Angelo** (1853-1907), American naturalist and traveler, born in Hungary, and came to the U. S. in 1856. In 1884-1900 he was professor of invertebrate zoology at the Academy of Natural Sciences, Philadelphia, and in 1883-92 curator of that institution. In 1890 he made a tour of exploration in Mexico, during which he ascended Popocatepetl, Orizaba and other peaks, and in 1892 he conducted the Peary Relief Expedition to Greenland. He examined the crater of Mont Pelée, Martinique, after the eruption of 1902, and again in 1903 and 1906. He was the first president of the Geographical Society of Philadelphia. His publications include *The Arctic Problem* (1893); *Alaska and the Klondike* (1899); *Mount Pelée and the Tragedy of Martinique* (1902); *The Tower of Pelée* (1904). With his brother, Louis, he edited *Lippincott's New Gazetteer* (1905).

**Heilprin, Louis** (1851-1912), American scholar and encyclopædist, born at Miskolcz, Hungary. He came to the U. S. in 1856, was privately educated, became associated with various encyclopædias, including the *New International*, and *Nelson's Encyclopædia*. With his brother he edited *Lippincott's New Gazetteer* (1905), and he wrote a *Historical Reference Book* (1884; 6th ed. 1899).

**Heilprin, Michael** (1823-88), Polish-American biblical scholar and critic, born at Piotrkow, Russian Poland, of a family famous for their Hebrew scholarship. He took an active part in the revolution in Hungary

(1848), where his family had settled in 1842, and became the supporter and personal friend of Kossuth. He was made Minister of the Interior under Szemere. In 1856 he came to the U. S., where he was on the staff of the *New American Cyclopædia*, and contributed to the *Nation*, from the time of its foundation (1865).

**Heine, Heinrich (Harry)** (1797-1856), German poet, was born at Dusseldorf, of Jewish parents. Harry shared his father's French sympathies and worship of Napoleon, to which he subsequently gave eloquent expression in the ballad *Die Beiden Grenadiere*. In 1822 he published a slender volume of *Gedichte*, reissued under the title *Junge Leiden* as the first part of the *Buch der Lieder* (1827). In 1823 appeared the *Lyrisches Intermezzo*. In the autumn of 1824 he wandered in the Harz Mts. (*Harzreise*), and in October visited Goethe, for whom he always expressed genuine admiration. As all government appointments in Germany were closed to Jews, Heine saw himself compelled to become a Christian (June, 1825). His uncle now sent him to Norderney; the poetic result was his two splendid cycles of poems *Die Nordsee*, and a prose *Reisebilder*. The *Buch der Lieder* contains a majority of his finest lyrics, which have been set to music many times.

In 1827 Heine obtained editorial work at Munich; but ill-health necessitated a change, and he went to Italy. Soon after his return his imagination was fired by the Paris July revolution; he determined to throw in his lot with the Liberals, and eventually settled in Paris in May, 1831. There he began to regard it as his vocation to draw France and Germany together. It was with this object that he published his *Französische Zustände* in 1831 and 1832, and in 1834 (in French) an account of the great intellectual movements in Germany from Luther to Hegel. In 1836 appeared, in French and German, his account of the German *Romantische Schule*. In 1835 the sale of his works was prohibited in Germany by a decree which designated him as the leader of *Das Junge Deutschland*. In 1840-3 he published *Lutetia*, dealing with contemporary politics in France; and in 1844 *Neue Gedichte*, partly as beautiful as anything in the *Buch der Lieder*, partly strained and cynical. In 1843 he revisited Hamburg. His impressions of the political and literary conditions in Germany were given in the sprightly satire *Deutschland, ein Wintermärchen* (1844). The news of his uncle's death, and the money troubles to which this

led, brought on a stroke of paralysis in January, 1845, which left him a physical wreck; and from May, 1848 to 1856 he was for the rest of his life chained to his 'mattress grave.' Intellectually still vigorous, he issued the *Romanzero* in 1851, and in 1854 he was engaged on his *Letzte Gedichte und Gedanken* (1869) and *Memoiren* (1884).

The last months of his life were cheered by the lady whom he called Mouche, or his 'beautiful angel of death' (she assumed the name Camille Selden, but her real name appears to have been Elise Krinitz). About no writer are such divergent views expressed as about Heine. He is perhaps least popular among his own countrymen. His admirers dwell on the beauty of many of his love lyrics, in which only Goethe has equalled him; on his skill in depicting nature—above all, the sea in its infinite moods; on his persistent attacks on German pedantry and Philistinism; and to palliate his failings, too obvious to be denied, they remind us of his constant struggle against ill-health. Heine's complete works have been edited by E. Elster (7 vols. 1887-90) and by G. Karpeles (9 vols. 1893).

**Heinsius, Antonius** (1641-1720), celebrated Dutch statesman known chiefly for his stubbornness in dealing with Louis XIV. Under William of Orange, he was the actual governor of Holland, and was an active promoter, if not the originator of the alliance between that country, Great Britain, Denmark, Hanover, Austria, Prussia, and Savoy, which opposed Louis. The correspondence between William and Heinsius is most valuable because of the detailed information it gives concerning the intricate political problems of the time.

**Heir**, in the common-law system of the United States, as of England, is the one upon whom the real estate of a person dying intestate devolves; the personal estate passing to a 'personal representative' for administration. In the United States inheritance is always to all the children or other nearest relations equally, irrespective of age or sex. In England, however, where the rule of primogeniture still obtains, the oldest male descendant who is most nearly related to the decedent takes the entire real estate; while if there is no male heir of equal or higher degree, the female descendants who stand nearest to the decedent in consanguinity divide the estate. See INHERITANCE; REAL PROPERTY; PRIMOGENITURE.

**Heirloom**, the term popularly applied to



articles of personal property which have been transmitted by will or otherwise through several generations.

**Hejaz**, or **Hedjaz**, an Arabian kingdom, formerly a Turkish vilayet, which renounced its allegiance to Turkey and proclaimed its independence on June 27, 1916. It extends along the northern half of the Red Sea coast from the Gulf of Akaba to s. of Taif, and is bounded on the n. by Syria, on the s. by the province of Azir, and on the e. by the Nefud Desert. It includes the sacred cities of Mecca, which is its capital, and Medina, and the seaports of Jidda and Yanbo el Bahr. It covers a territory of approximately 96,500 sq. miles, with an estimated population of 1,500,000, of which about 250,000 dwell in the cities, while the rest are nomadic. The country is for the most part arid and barren, though fertile valleys occur in the s., and the grazing of sheep, goats, and camels is carried on to some extent in the n. The Arab inhabitants have long been known for their love of independence and on more than one occasion have caused trouble for the Turkish government. In June, 1916, the Grand Sheriff of Mecca, El Hussain ibn Ali, revolted against the Turkish rule, Arabian troops captured Medina, Taif, Kinfunda, and Jidda, a declaration of independence was issued, and El Hussain ibn Ali was declared king. The new kingdom was formally recognized by Great Britain, Italy, and France early in 1917. The Arabs rendered valuable assistance to the Allies in Asia during the Great War, particularly in the capture of a large section of the Hejaz railroad running parallel with the Red Sea from Damascus to Medina.

**Hejira**, or **Hegira** (Arabic, 'flight'), specifically, the flight of Mohammed from Mecca to Medina, A.D. 622. The Caliph Omar (634-44) named the Mohammedan era after this event, dating it from the first day of the year in which the flight occurred (July 16). The years, being purely lunar, are about eleven days shorter than those of the Christian era. To convert a date in the Hejira reckoning into the corresponding date in the Christian reckoning, multiply the former by 0.970224, and add 621.5774: the whole number will indicate the year, and the approximate day will be obtained by multiplying the decimal by 365.

**Hekla**, or **Hecla**, volcanic mountain (5,108 ft.) of Iceland, in the s., 70 miles e. of Reykjavik. Since the ninth century it has been in frequent eruption.

**Hel**, in the mythology of the ancient Germanic and Scandinavian races, the goddess of the lower world and of death. She was hurled by the All-father into the depths of Nifheim, where she ruled over those human beings who died of disease or old age. In the Middle Ages she became confounded with the kingdom she ruled over, and eventually the double conception was held to be synonymous with hell.

**Helder**, a fortress, seaport, and town of the Netherlands, at the northern extremity of province of North Holland, at the entrance to the Zuider Zee, 51 miles n. of Amsterdam. It is protected against the sea by embankments of Norwegian granite, nearly 5 miles long and 30 ft. across the top. At Willemsoord, close by, are the stores of the Dutch navy and a naval cadet school. Helder was first fortified by Napoleon in 1811, and since 1826 has been immensely strengthened by the Dutch.

**Helen**, heroine of the Trojan War (See *Troy*), was the daughter of Tyndareus and Leda, and sister of Pollux, Castor, and Clytemnestra. Her surpassing beauty caused suitors from all Greece to ask for her hand; but after Menelaus was chosen, Paris bore her off to Troy, and hence arose the Trojan War. After the capture of Troy she returned to Sparta with Menelaus. Consult Lang's *Helen of Troy*.

**Helena**, city, capital of Montana, county seat of Lewis and Clark co. It is picturesquely situated in the Prickly Pear Valley, on the eastern side of the main range of the Rockies; at an elevation of 4,108 ft. Prominent buildings and public institutions include the State capitol, Federal building, U. S. assay office, a public library, auditorium, State Historical Society, Wesleyan University of Montana, and Mount St. Charles' College. 'The Gate of the Mountains,' where the Missouri river cuts through the main range of the Rockies, 18 miles from Helena, is a point of historical interest, the Lewis and Clark party having passed through this picturesque canyon on its westward journey. Within four miles of the city the largest Natural Hot Water Springs in the world are located. Helena is the industrial and financial center of a region rich in gold, silver, and iron, and in agricultural products. It was founded in 1863 by gold seekers, who mined from the 'Last Chance Gulch' (now Main Street) about \$35,000,000. It became the capital of Montana Territory in 1869; and in 1889, when Montana became

a State, it was chosen the State capital; p. 15,056.

**Helena**, city, Arkansas, county seat of Phillips co., is situated on the Mississippi River. The town is engaged chiefly in the cotton and lumber industries, over 100,000 bales of cotton and 5,000 cars of lumber being shipped annually. Industrial establishments include lumber and cottonseed-oil mills, cotton compresses, railroad shops, and manufactures of boxes, chairs, brooms, and cotton yarn; p. 8,546.

**Helena, Flavia Julia** (c. 247-c. 327), the wife of Constantius Chlorus and mother of Constantine the Great. She is famous for her attachment to Christianity, and her reputed discovery at Jerusalem of the Sepulchre of Christ and the wood of the Cross.

**Helena, Hélène, or Elèna**, Queen of Italy (1872), the fourth daughter of King Nicholas of Montenegro, was born in Cetinje, the capital of that principality. She was educated in St. Petersburg, and in 1896 married Prince Victor Emmanuel of Italy, who succeeded to the throne in 1900. She is an accomplished linguist and musician, and has considerable poetic talent.

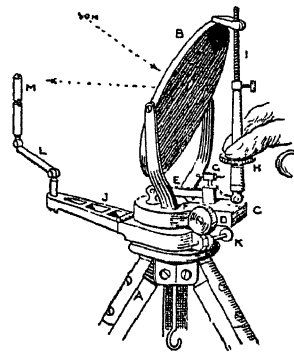
**Helicon**, a mountain-range (5,736 ft.) in the southwest of Bœotia, in ancient Greece, was celebrated as the favorite seat of the Muses. At the foot of the range stood the village of Ascræ, the residence of Hesiod, and the seat of the earliest school of poetry in Greece.

**Heligoland, or Helgoland**, a small island (130 acres) in the North Sea commanding the entrance of the Kiel or Kaiser Wilhelm Canal; 28 miles northwest of the mouth of the Elbe. It was anciently a religious center of the Frisians; was ceded to Great Britain by Denmark in 1814, and by Great Britain to Germany in 1890 in exchange for Zanzibar. The German government at once undertook the fortification of the island, and it became an important feature in the defence of the German coasts.

The first important naval engagement of the Great War (1914-18) occurred off Heligoland on Aug. 28, 1914, between British and German naval forces. The British forces engaged included a submarine flotilla under Commodore Keyes, two destroyer flotillas under Commodore Tyrwhitt, a light-cruiser squadron under Commodore Goodenough, a battle-cruiser squadron under Vice-Admiral Beatty, and a cruiser squadron under Rear-Admiral Christian. The action, which was provoked by Admiral Beatty's squadron, be-

gan early in the morning and lasted until about 1:30 P. M. The British cruiser *Arethusa* was badly damaged, and British casualties amounted to 32 killed and 52 wounded. The Germans lost three cruisers—the *Mainz*, the *Köln*, and the *Ariadne*, and one destroyer—the *V-187*. At least 700 of the German crews perished and 300 prisoners were taken by the British. See EUROPE, GREAT WAR OF.

**Heliograph**, an instrument used for signalling by flashing the sun's rays from the face of a mirror. If the mirror is vertically below the sun, or between it and the receiving station, a second mirror must be used to direct the sun's rays on to the face of the



*Heliograph: Sending Message by Direct Reflection.*

A, Tripod with cap; B, signalling mirror; C, tangent box; D, tangent screw; E, lever arm; F, spring; G, capstan-headed screw for regulating heat; H, key; I, screw in socket; J, jointed arm; K, clamping screw for arm; L, double-jointed sighting rod; M, sighting vane.

first. If the mirror is directed exactly at the required spot, its flashes cannot be read more than ten yards on each side of the latter when the distance is a mile, or fifty yards if two miles. The mirrors, sighting-vane, and other mechanism for adjustment are mounted on a tripod. Communication has been established over 215 miles.

**Heliometer**, an instrument originally devised (as the name implies) for measuring the sun's diameter, but now chiefly applied to micrometrical work on the stars. Fraunhofer gave it, in 1814, its modern form by dividing the object-glass of a telescope into

two movable segments, the amount of separation imparted to which serves for the precise measurement of sky intervals. The most important results have been obtained with the similar though somewhat smaller instruments at the Cape of Good Hope and Yale University observatories.

**Heliopolis** ('city of the sun'), the Greek name of the city called by the Egyptians On, situated on the e. side of the Pelusiac branch of the Nile, near the apex of the Delta. It was one of the most ancient and important cities of ancient Egypt. The obelisk 'Cleopatra's needle,' taken in 1878 to England, and that brought to New York in 1880, were originally transported to Alexandria from this city. The Syrian Baalbek was also known to the Greeks as Heliopolis. See BAALBEK.

**Helios**, the god of the sun in Greek mythology, was the son of Hyperion and Thea, and is himself often called Hyperion. Greek poetry describes him as starting from a splendid palace in the e., and traversing the sky in a chariot drawn by four horses, to arrive at another palace in the w. His worship was common throughout Greece, particularly in Rhodes, where the famous Colossus was a representation of him. In later times he was identified with Apollo.

**Helioscope**, a form of telescope for viewing the sun without injury to the eyes, either by using smoked or obscured glass, or by means of mirrors of transparent glass which reflect only a small proportion of the light.

**Heliostat**. See **Astronomy**.

**Heliotherapy**, a method for the treatment of disease by application of the rays of the sun. Its therapeutic effects are attributed generally to the ultra-violet rays (see ACTINIC RAYS), which are believed to exert a more marked chemical action than the other rays. These rays have a three-fold effect on the skin. They cause a latent hyperemia, a pigmentation, and a thickening of the epidermis. Heliotherapy has found its greatest field of usefulness in skin diseases—as lupus, acne, eczema, and psoriasis,—and in surgical tuberculosis (*i.e.* of the bones and joints). It has been used also in gout and arthritis, and in pulmonary tuberculosis and pneumonia. The treatment may take the form of general sun baths or the sun light may be concentrated by the use of large mirrors. It must be instituted gradually, and always under medical advice. One of the foremost exponents of the sun treatment is Professor A. Rollier of Switzerland, who has had remarkable results in cases of surgical tuberculosis. Finsen's

Institute in Denmark is also well known. Various American institutions have adopted this form of treatment, chiefly in conjunction with other methods.

**Heliotrope** (*Heliotropium*), a genus of plants belonging to the order Boraginaceæ. They are hardy outdoor annuals and cultivated greenhouse shrubs. Heliotrope is popular as a pot plant and should be grown in a moderately cool airy house. Stout cuttings



Photo from De La Mare Co.

*Heliotrope*

make the best plants. A light rich soil and plenty of moisture are the chief requirements. The Seaside Heliotrope (*H. curassavicum*) grows wild along the sandy shores of the Southern United States.

**Heliotrope**. See **Bloodstone**.

**Heliotropism**, the tendency of a plant or animal to respond to the stimulus of light. The stems of window plants or of trees in the edge of a forest assume a curve in the direction of the light, and are said to be positively heliotropic, as are the leaf stalks; the leaf blades take up a vertical position facing the light, and are transversely heliotropic. Aerial roots, the stems of some tendril-climbers, and the haptera or holdfasts are negatively heliotropic, and turn away from the light.

**Helium** (He<sub>4</sub>), an inert, non-oxidizable, colorless, gaseous element of density 1.98. Evidence of the existence of such a gas in the sun was obtained by Sir Norman Lockyer during the eclipse of 1868. In 1895, Sir William Ramsay isolated a new element, noted for its extreme inertness and inability to enter into any stable compound. When the mineral uraninite was decomposed by acid, a

gas was given off which could not be caused to combine with oxygen, *i.e.*, to 'burn,' and which, when examined spectroscopically by means of an electric discharge, showed a bright yellow spectral line which was identified with that first detected by Lockyer in the solar spectrum. The name helium which had been suggested by Lockyer for the substance found in the sun was then assigned to this new element by Ramsay. The best source of helium is the mineral thorianite, largely an oxide of thorium. The thorianite dissolves easily in concentrated nitric acid and liberates helium.

The lightness of helium—it is, next to hydrogen, the lightest known gas—and its non-inflammability, make it a well nigh perfect gas for filling dirigible balloons and other instruments, which depend for their buoyancy upon the displacement of air. A wealth of experimental observations raised the question of the transmutation of the elements. Can one element be transmuted into a different one? Can radium give off helium, and finally become lead? Can radium itself be a product of the decomposition of uranium? Experiment seems to answer all of these questions affirmatively. Rutherford and other experimenters showed that radium gave off various radiations known as the alpha rays, the beta rays, and the gamma rays. The first of these were shown to be positively charged, the second negatively charged, while the third were identical in their characteristics with the Roentgen, or X rays. The alpha particles are positively charged particles and are probably helium atoms from which two of the negatively charged particles, or electrons, have been removed. They consist of four positive and two negative electrical particles, and may attain a velocity of 18,000 miles per second. By the bombardment of the atoms of nitrogen and other elements by these rapidly flying helium atoms Rutherford brought about their atomic disintegration, with the production of hydrogen. The helium atom is the agent in this further example of the transmutation of the elements.

**Hell**, a term used both in theological and popular speech to denote the final abode or condition of the lost. As used in the King James Bible its interpretation demands the utmost caution, as it represents four different Hebrew or Greek words, Sheol (Hades), Tartaros, and Gehenna. The Hebrew *Sheol*, which appears in the Septuagint and the New Testament as *Hades*, seems to have been understood as a dim, shadowy region, where

the dead in some fashion continued to exist, but where they could hardly be said to live; further, it was the destination of good and bad alike, and was not thought of as a place of punishment. Sheol is thus almost identical with the Greek Hades. In the apocryphal and apocalyptic books, however, Hades begins to appear as a place where moral qualities have their appropriate recompense—reward for the good, penalty for the wicked; and the distinction is found clearly expressed in the New Testament—*e.g.* in the parable of the rich man and Lazarus, in which, however, the name Hades is reserved for the place of torment, the other being designated Abraham's bosom.

The Greek *Tartaros*, which appears in the New Testament only as a verbal form, was the name of the locality beneath Hades, in which, according to the Homeric poems, the Titans and other insurgent supernatural beings were confined. The whole conception, however, is somewhat out of touch with New Testament ideas, and has more in common with the teaching of Jewish apocalyptic books. *Gehenna*, in the Apocrypha and New Testament, comes nearest to the modern conception of hell as a place of woe. When we have said that the New Testament authors, with all their remarkable appreciation of moral values and issues, do not utilize the doom of the reprobate as a religious motive, and that they nevertheless speak of it as involving the sternest imaginable suffering and loss, and—according to the opinion of most—as permanent, we have nearly exhausted all that can lay claim to certainty on scriptural authority. In the main, this may be said to be the orthodox position of all the great branches of the church. The Roman Catholic and Greek Churches, indeed, have instituted the doctrine of purgatory as a place of purification for some believers who die in sin; but the repudiation of the doctrine forms an element in Protestant confessions generally.

At least two other theories of hell may be mentioned. One of these is associated with the name of Origen, and variously termed Universalism, Restoration, or the Larger Hope—*viz.* that all men ultimately will be saved. Another view, not without its adherents, is that of Conditional Immortality or Annihilationism, according to which complete destruction and not endless suffering is the doom of the finally impenitent. (See *CONDITIONAL IMMORTALITY*.) See *ESCHATOLOGY* and the articles there cited. Consult Alger's *Critical History of the Doctrine of a Future Life*;

F. W. Farrar's *Eternal Hope*; Salmond's *Christian Doctrine of Immortality*.

**Hellas**, the name given by the ancient Greeks to their country as a whole, including all lands inhabited by Hellenes, from Sicily or Marseilles in the w. to the Black Sea in the e. The name came into use during the 7th century B.C. It never denoted a political union.

**Hellbender**. See **Menopome**.

**Helle**, in Greek mythology, the daughter of Athamas and Nephele, king and queen of Thessaly. Athamas, tiring of his wife, put her away and took another, whereupon Nephele fearing danger to her children from their stepmother, set them on the ram with the golden fleece, who fled with them over the sea. In crossing the strait between Asia and Europe, Helle fell into the sea and was drowned. The strait was called Hellespont in her honor.

**Hellebore** (*Helleborus*), a genus of plants belonging to the order Ranunculaceæ, including about eight species native to Europe and Asia. They are erect herbaceous perennials, with large palmately divided leaves and handsome white, green, purple, red or yellow flowers. *H. niger*, known as Christmas Rose, has evergreen leaves and rose-tinted flowers, which bloom very early, sometimes even in winter. Its black rootstock is said to have medicinal properties, but it is an acrid poison. The name hellebore is applied also to a number of plants of other genera, as White Hellebore (*Veratrum album*), a European plant of the lily family, the roots of which contain an acrid poison, used as an insecticide.

**Hellen**, in Greek tradition the ancestor of the race, was the son of Deucalion and Pyrrha, or of Zeus and Dorippe. He was king of Phthia in Thessaly.

**Hellenism**, the name usually applied to that type of critical taste in literature and art which prefers to Hebraic intensity and Gothic exuberance the severity of artistic restraint and the chaste purity in design and execution characteristic of Greece during the Periclean epoch.

**Hellenist**, one who adopts Greek customs and language, a name given especially to those among the Jews, and afterwards in the Christian church of Judea, who, either by birth or by residence, and by the adoption of the Greek language, manners, and usages, were regarded as Greeks—in opposition to the Hebrews properly so called, and to the Hellenes, or Greeks proper.

**Heller, Stephen** (1813-88), Hungarian

pianist and composer, was born in Budapest. He made a brilliant début at the age of nine, gave concerts in Vienna at twelve, and at fifteen toured in Hungary, Poland, and Germany. In 1838 he settled in Paris, where he spent the remainder of his life. Heller's works are marked by a charm and delicacy that place him almost on a level with Chopin as 'the poet of the piano.'

**Hellespont**. See **Dardanelles**.

**Hell Gate**, a narrow portion of the East River, between Long Island and the upper part of Manhattan Island, and on both the e. and w. sides of Ward's Island. The difference in the time and height of the tidal currents entering the East River from Long Island Sound and from New York Bay, the swiftness of the currents, and the number of rocks made navigation difficult and dangerous. In 1852, 1876 and 1885 the U. S. Government blew up some of the most dangerous rocks, and continued dredging and rock removal has provided a channel 200 ft. wide at its narrowest point, with a minimum depth of 26 ft. In 1917 a railroad bridge across the East River at Hell Gate was completed. See **BRIDGES**.

**Helmet**, defensive armor for the head, chiefly of leather or metal, made in a great variety of shapes, round-topped helmets being the most usual. A striking exception is the conical helmet worn by William the Conqueror, as figured in the Bayeux Tapestry. Crested helmets, in which the crest takes the form of a lion, eagle, or a griffin, date from the 13th to the 15th century. Assyrian helmets in bronze are known on bas-reliefs as far back as 1000 B.C. The casque, the cabasset, and the morion are amplified and sometimes decorated examples of the helmet; and still another variety is the burgonet. After the introduction of firearms, helmets became less necessary, and their military use was limited for the most part to heavy cavalry, lancers, and artillery, and at length practically discontinued. During the Great War, however, their usefulness was soon recognized as a protection against shrapnel bullets and shell fragments, and they eventually became a part of every soldier's equipment. The best material for helmets was found to be manganese steel and of this the helmets of the United States and British troops were made. The German helmets of nickel-chrome steel were heavier and more easily perforated. Before the close of the war helmets were in use by every country engaged. In warm countries special helmets of cork, pith, or other light substance are worn by soldiers, and to a less

extent by civilians, as a protection from the sun. The name is also indiscriminately applied to the protective headdress worn by firemen, divers, policemen, and others. See ARMOR. Consult Dean's *Helmets and Body Armor in Modern Warfare* (1920).

**Helmet Bird**, a name sometimes given to the Turacos or Plantain Eaters.

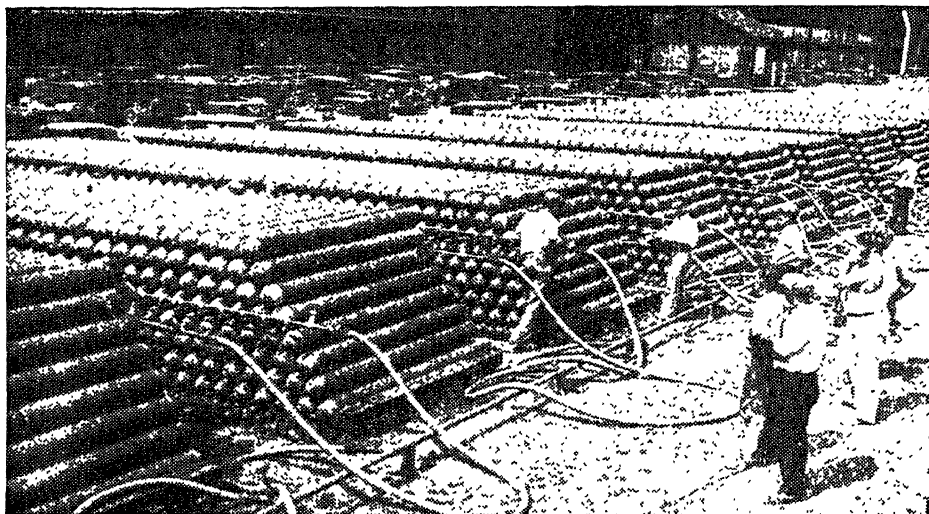
**Helmet Crab**, a species of King-crab.

**Helmet Shell** (*Cassia*), a genus of marine gasteropod molluscs in which the massive shell frequently consists of differently colored layers, and is therefore used for carving shell cameos.

destructibility in chemical processes. To him are ascribed the discovery of sulphuric acid, the first use of the word 'gas,' and the scientific use of the thermometer; he also profitably studied the fluids of the human body. His son published his works as *Ortus Medicinæ* (1648).

**Helmstedt**, town, Germany, in the republic of Brunswick, 24 miles southeast of the town of Brunswick. It has several mediæval houses; p. (1925) 17,170.

**Helmund**, or **Helmand**, river, Afghanistan, rises on the s. of the Hindu-Kush, and flows for about 60 miles in a southwesterly



*Helium Tanks—Balloon being inflated.*

**Helmholtz, Hermann von** (1821-94), German scientist. Although his earlier researches were mainly physiological, he took rank as a physicist and mathematician in 1847, when he published his striking tract on the conservation of energy. Naturally gifted with a powerful mathematical mind and a profound physical intuition, he gave a new direction to physiological research in seeing and hearing, his *Sensations of Tone* (1863-70) and his *Physiological Optics* (1867) being epoch-making works. He created a new field in hydrodynamics by his famous investigations on vortex motion; and made valuable contributions to the theories of electrodynamics, and thermodynamics.

**Helmont, Johann Baptist van** (1577-1644), Belgian chemist. He added greatly to the development of chemistry by emphasizing the laws of balance of matter, its in-

direction, receiving numerous tributaries, by which it drains the southern part of the country, and empties into the swampy Hamun depression in the southwestern part of Afghanistan. The river furnishes power to several mills.

**Heloderma**, a genus of American poisonous lizards, of which the best known is the Gila monster of Mexico and adjacent territories of the United States. The salivary glands of the lower jaws are converted into poison sacs comparable to those of poisonous snakes; and the teeth form grooved fangs. The bite is always severe, and is generally fatal to small animals and sometimes to man. The skin is rough and warty, and variegated in black and yellow.

**Héloïse**. See **Abélard**.

**Helotes**, or **Helots**, the serf population of Laconia in ancient Greece. They formed

the lowest class in the Spartan state, and were the property of the state, not of individuals. However, any Spartan could at any moment call on a helot to perform any service for him. In 464 B.C. a general revolt occurred, which, after a war lasting several years, the Spartans put down only with great difficulty.

**Helper, Hinton Rowan** (1829-1909), American author, born and educated in the South. He became famous as the author of *The Impending Crisis in the South, and How to Meet It* (1857), which was an economic argument against slavery. He was consul at Buenos Aires in 1862-66, and afterward projected the 'Three Americas Railway,' to connect Bering Strait with the Straits of Magellan. His other publications include *The Negroes in Negroland, the Negroes in America, and the Negroes Generally* (1868); *The Three Americas Railway* (1881).

**Helsingborg**, or **Hälsingborg**, fortified seaport, Sweden, on the Sound. It is an important manufacturing town with copper works, sugar refineries and breweries. Coal and potter's clay are found in the vicinity. It is one of the oldest towns in Scandinavia; p. (1932) 56,620.

**Helsingfors**, or **Helsinki**, capital and seaport town of Finland, on the Gulf of Finland, 250 miles w. of Leningrad, Russia. The town is remarkably well built, being mostly of modern construction, since 1808. It is a famous intellectual center and the home of many learned societies, the Finnish University, a polytechnic school, and an observatory. The fine harbor is ice bound for several months each year, but the city has considerable trade in pulp and paper, timber and livestock. It is also a busy industrial center, producing beer and spirits, tobacco and carpets. Helsingfors was founded by Gustavus Vasa of Sweden in the 16th century, about 4 miles northeast of the present site, and was removed by Christina, daughter of Gustavus Adolphus, in 1640; p. 293,000.

**Helsingor**, or **Elsinore**, seaport, Denmark, on the Sound. To the e. of the town is the imposing fortress of Kronborg (1574-83), reputed to be the home of Hamlet and immortalized by Shakespeare, and northwest of the town is the former royal chateau of Marienlyst. The harbor is rarely frozen, and admits ships of twenty-feet draught. Shipbuilding is an important industry; p. 15,841.

**Helst, Bartholomæus van der** (1613-70), Dutch painter. He was chiefly a painter of portraits, which are of a very high order. His most famous picture, known as *The*

*Banquet of the Civic Guard*, or *The Peace of Münster*, now in Amsterdam, contains 24 full length portraits. The National Gallery, London, has a *Portrait of a Lady* by him; the New York Historical Society a portrait of an *Unknown Lady*, and the Metropolitan Museum, New York City, a *Dutch Burgomaster*.

**Helvetia**. See **Switzerland**.

**Helvetic Republic**, the government set up by the French Directory within the Swiss Confederation, which lasted from March, 1798, to February, 1803. Lucerne was made the capital of the state.

**Helvetii**, a Celtic nation who lived between the Jura Mountains, the Lake of Geneva, the Rhone, and the Rhine as far as Lake Constance. In 58 B.C. they endeavored to invade Gaul, but were forced back by Cæsar. Later they were Romanized.

**Hemans, Felicia Dorothea** (1793-1835), English poet. Mrs. Hemans visited Scotland in 1829, and enjoyed the friendship of Scott, Jeffrey, and Wordsworth. Her work, essentially sentimental in character, includes *The Sceptic* (1820); *Lays of Many Lands* (1825); *Records of Women*—her best work (1828); *Songs of the Affections* (1830); *Hymns for Childhood* (1834).

**Hematite**, the chief commercial iron ore, containing 70 per cent. iron and 30 per cent. oxygen when pure; commercial hematite ores usually average about 50 to 55 per cent. iron. An impure earthy hematite which is usually mixed with clay is known as *red ochre*. Hematite is widely distributed and the numerous foreign localities afford beautifully crystallized specimens. In the United States vast beds of hematite are found in Northern Michigan, Northern Wisconsin, and Minnesota; and deposits also occur in New York, Pennsylvania, Alabama, and Tennessee.

**Hemingway, Ernest** (1898- ), author, was born in Oak Park, Ill. Among his works are *The Sun Also Rises* (1926); *Men Without Women* (1927); *A Farewell to Arms* (1929); *Death in the Afternoon* (1932); *For Whom the Bell Tolls* (1940).

**Hemiplegia**, a paralysis of the parts of the body supplied by the motor nerves of one side, due most frequently to cerebral softening or cerebral hæmorrhage. The paralysis may be partial or complete, but it is seldom uniform. When the paralysis is right-sided, aphasia often results, since the centers for speech lie in the left cerebral hemisphere. If the face be involved, the wrinkles and facial lines are effected, and the mouth is pulled

towards the unaffected side. The paralyzed arm soon drops limp and helpless to the patient's side.

**Hemiptera**, an order of insects known as 'bugs,' including such forms as water-bugs, lice, cicadas, and aphides. They all have a suctorial mouth furnished with a long beak. There are more than 36,000 species and most of them are exceedingly destructive. A few forms are economically useful, producing wax and cochineal and preying upon injurious insects. There are nearly always four wings, though these are not infrequently absent in certain generations, as in aphides, or in the female sex, as in scale insects. The Hemiptera live upon the juices of plants or animals.

**Hemlock**, a plant belonging to the order Umbelliferae. The common hemlock is a tall plant, with daintily-cut, decompounded, glossy green leaves, arising from a smooth stem



*Hemlock*

1, Small leaf; 2, flower; 3, petal; 4, ovary; 5, fruit, side view; 6, longitudinal section; 7, transverse section.

with purple markings. The whole plant has a strong, disagreeable, mouselike odor when bruised. It is occasionally found in waste places in America, having been introduced from Europe. It is a powerful poison by reason of the alkaloid conine which it contains, and which was the poison taken by Socrates. The leaves and fruit are occasionally used in medicine, an extract, juice, and tincture being prepared.

**Hemlock Tree**, a handsome, graceful, evergreen tree frequenting rocky woods in the cool or mountainous regions of North America. The foliage is very light in aspect, small, linear leaflets spreading in a flat spray, dark green above and silvery below; the cones are small, numerous, and dependent. Hemlocks grow rapidly, and attain a great height, becoming very ragged and picturesque when

old. The wood is soft, splintery, light red hue, and in most species is used only for sheathing and interior building purposes, as it warps when exposed. The bark is used for tanning leather.

**Hemorrhage**. See *Hæmorrhage*.

**Hemp**, an erect-growing fibre plant growing wild in Asia, but cultivated in many other regions. It attains to from four to eight or ten feet in height and bears a general resemblance to the common stinging nettle—to which it is botanically allied. The small flowers are a yellowish green, the stem square, and the leaves divided into fine, narrow, taper-pointed, rough, serrated lobes. Its cultivation resembles that of flax and the most important hemp growing countries are Austria, Russia, Italy, Turkey and China. Hemp seed is a favorite food for poultry and for cage birds. The plant is cultivated chiefly for its fibre which is used for sailcloth, pack-sheets, ropes, caulking of ships and all kinds of cordage. See *MANILA HEMP*.

**Hempel, Frieda** (1885- ). German operatic soprano. She made her début in Berlin in 1905. She was a member of the Berlin Opera, 1907-12, and from that time until 1923 was connected with the Metropolitan Opera Company, New York City, also appearing in concerts in Europe and America. She has appeared in some 80 operatic roles. A feature of her concert work has been the 'Jenny Lind' concerts.

**Hems, or Homs** (anc. *Emesa*), city, Syria. It was noted for its temple of the sun and has always been famous for its fruit, especially grapes, and its horses. Silk is the leading industry; p. 52,792.

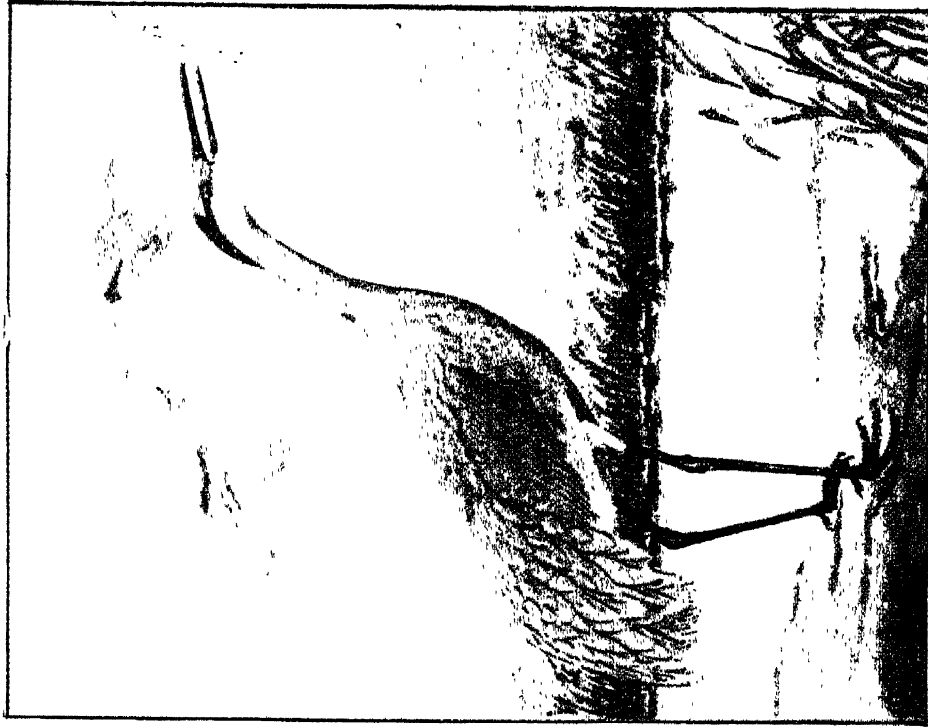
**Henbane**, a tall herb, of the order Solanaceae, having large hairy leaves, often ten inches long, and in summer bearing numerous creamy flowers with purple markings. The whole plant has a strong disagreeable odor. It has become naturalized in America in waste places. Henbane is a powerful poison by reason of the alkaloids which it contains. It is used in small doses in medicine, chiefly as a sedative, in the form of the extract, the juice, or the tincture.

**Henderson, Alexander** (1583-1646), famous Scottish divine. He took a leading part in opposing the attempt to force a liturgy on the Scottish Church, 1636, and from that time he was the foremost Presbyterian divine of his day. He became chaplain to Charles I. in 1641. He drafted the Solemn League and Covenant. He published *Bishops' Doom*





BLACK-CROWNED NIGHT HERON (1/6 nat. size)



SANDHILL CRANE (1/12 nat. size)

FROM DRAWINGS BY R. I. BRASHER

(1638; reprinted 1762), and *Sermons, Prayers, and Pulpit Addresses* (ed. R. T. Martin, 1867).

**Henderson, Arthur** (1863-1935), British public official from Scotland, was born in Glasgow. He worked as a moulder in Newcastle and in Durham, became prominent in the trade union movement and was mayor of Darlington in 1903. He held various commissions during the World War. In 1917 he visited Russia on behalf of the British Gov-

ernment but his policy of favoring British participation in a socialist and labor conference in Stockholm forced him to resign. In the first MacDonald ministry he was Secretary of State for Home Affairs (1924) and in the second was Foreign Secretary (1930-31). The 1933 Water Peace Prize was awarded to him by the Carnegie Foundation for International Peace, for his work as president of the Disarmament Conference. On Dec. 10, 1934, he was awarded the Nobel peace prize for 1934.

**Henderson, Peter** (1823-90), American horticulturist, born in Scotland. Has been called the 'father of American horticulture.'

**Henderson, Leon** (1895- ), U. S. economist, born in Millville, N. J., made head of the Office of Price Administration and Civilian Supply in 1941.

**Henderson, Richard** (1734-85), American pioneer, one of the founders of Kentucky, was born in Va. He organized and was president of the famous 'Transylvania Land Company,' which, by the treaty of Watauga with the Cherokee Indians, acquired, 1775, a large tract of land between the Cumberland and Ohio Rivers, to which many settlers soon came and on Henderson's initiative, adopted a brief code of laws.

**Henderson, Sir Nevile** (1882-1942), British diplomat, was minister to Egypt (1924-28); to France (1928-29); to Yugoslavia (1929-35); to Paraguay (1935-37); ambassador to Argentina (1935-37); and to Germany (1937-39). He was a proponent of the Chamberlain policy of appeasement, and in August 1939 he attempted to unite Germany and Poland into a common course. He described his failure in *Failure of a Mission*.

**Henderson, William James** (1855-1937), American music critic and author. His published works include *The Story of Music* (1889); *Preludes and Studies* (1891); *What Is Good Music* (1898); *How Music Developed* (1898); *Richard Wagner* (1901); *Modern Musical Drift* (1904); *The Art of the Singer* (1906); *The Soul of a Tenor* (1912); *The Early History of Singing* (1921).

**Hendrick, Burton J.** (1871- ), American author and editor. He was a member of the staff of the *New York Evening Post* (1899-1905), of *McClure's Magazine* (1905-13) and associate editor of *The World's Work* (1913-27). His published works include *The Age of Big Business*, *The Life and Letters of Walter H. Page*, *American Ambassador to Great Britain, 1913-18* (awarded the Pulitzer prize in 1922), *The Training of an American: Earlier Life and Letters of Walter H. Page* (awarded the Pulitzer prize in 1929), *The Jews in America* (1923); *The Victory at Sea* (with Admiral Sims, awarded the Pulitzer prize in 1920), *William Crawford Gorges, His Life and Work*.



Henbane  
1, Corolla, open; 2, calyx.

**Henderson, Charles Richmond** (1848-1915), American sociologist. His published works include *Introduction to the Study of Dependents, Defectives and Delinquents* (1893); *Social Spirit in America* (1896); *Modern Prison Systems* (1903); *Modern Methods of Charity* (1904); *Social Programmes of the West* (1913).

**Henderson, James Pinckney** (1808-58), American soldier and public official, served as

**Hendyng, Proverbs of**, a series of Middle English six-lined stanzas (c. 1300), each closed by the addition of a proverb attributed to Hendyng, a traditional wise man.

**Henequen**, a Mexican fibre plant closely allied to the true sisal. The fibre is used for rope, cordage and bagging. It is cheaper than sisal and the plant has a longer life. It is commercially known as Mexican sisal and thousands of tons are exported annually. See also **HEMP**.

**Heney, Francis Joseph** (1859-1937), American lawyer. In 1895 he successfully prosecuted the Oregon land fraud cases for the United States government. He then undertook the exposure and prosecution of graft and bribery cases in San Francisco.

**Hengist** (d. 489) and **Horsa** (d. 455), legendary princes of the Jutes who landed at Ebbsfleet, on the Isle of Thanet, having been invited by Vortigern to help him in repelling the Picts and Scots. Later they turned against the Britons themselves.

**Hen Hawk**, a name given to several of the larger American buzzard hawks, especially the redtail; none of which, however, is so dangerous to poultry as the sharpshin, sometimes distinguished as 'chicken hawks.'

**Henie, Sonja** (1910- ), figure skating champion and motion picture actress. Born in Norway, she won the figure skating championship of that country in 1924, the world's championship in 1927, and the Olympic championships in 1928, 1932, and 1936. Motion pictures in which she has starred are *One in a Million*, *Happy Landing*, *Second Fiddle*, and *Girl of the North*. Her personal appearance tours in 1937, 1938, 1939, 1940 attracted tremendous throngs everywhere.

**Henley, William Ernest** (1849-1903), English critic and poet. He was a life-long invalid, and much of his work was done under conditions that would have crushed an intellectually weaker man. His style is brilliant and individual; his humor is often grim but trenchant and powerful, and his works show keen insight and understanding. He was editor of *London*, of the *Magazine of Art*, of the *Scots Observer*, of the *New Review* and the series *Tudor Translations*. His original works include *Book of Verses* (1888); *Views and Reviews—Literature* (1890); *Song of the Sword* (1892); *The Centenary Burns* (with T. F. Henderson, 1896-7); *The Works of Lord Byron* (only 1 vol., *Letters*, published 1897); *English Lyrics* (1897); *Poems* (1898); *For England's Sake* (1900); *The Edinburgh Shakespeare Folio* (1901-4); *Views and Re-*

*views—Art* (1902); and the plays *Deacon Brodie*, *Beau Austin*, *Admiral Guinea* (1892), and *Macaire* (1895), these in collaboration with Robert Louis Stevenson, who was his intimate friend for many years. Consult Cornford's *W. E. Henley* (1913).

**Henley-on-Thames**, market town, England, famous for its annual regatta in July. On several occasions crews from American colleges have competed in this regatta; p. 6,836.

**Henna**, a substance used for dyeing the nails, hair and beard. It is obtained from the small white fragrant flowers of a tropical shrub or tree, which are dried, powdered and made into a paste with hot water and catechu. In India henna is used for coloring leather and various fabrics.

**Hennepin, Louis** (c. 1640-c. 1706), Belgian Franciscan missionary and explorer in America. He went to Canada in 1675. In 1678 he joined La Salle, and was despatched with two companions to explore the upper Mississippi and the Illinois to its mouth. On April 11, 1680, he was captured by a band of Sioux Indians, and was adopted into the tribe. During his captivity he visited the Falls of St. Anthony, probably being the first white man to accomplish this, and escaping, soon afterward returned to France. In 1683 he published his famous book *Description de la Louisiane, nouvellement découverte*, containing the first descriptions ever published of Niagara Falls and the Falls of St. Anthony. In 1697, La Salle then being dead, he issued a new edition *Nouvelle découverte d'un très grand pays situé dans l'Amérique*, in which he claimed to have preceded La Salle in passing down the Mississippi to its mouth. This claim is demonstrably false. Parkman calls this part of the narrative, 'a rare monument of brazen mendacity,' and calls Hennepin 'the most impudent of liars.' Hennepin also published *Nouveau voyage* (1698). Many editions of his travels, in various languages, have appeared.

**Henner, Jean Jacques** (1829-1905), French painter. He was one of the most poetic and realistic figure artists of the French school, especially of the nude, his flesh tints resembling the work of Correggio. Among his best works are *Biblis changée en source* (1867), and his *Chaste Suzanne* (1865), in the Luxembourg, Paris. Others are *Portrait* (of himself); *Naiades* (1875); *The Levite Ephraim* (1898); *The Dream* (1900). Some of his pictures appear in the Metropolitan Museum, New York, in the Brooklyn In-

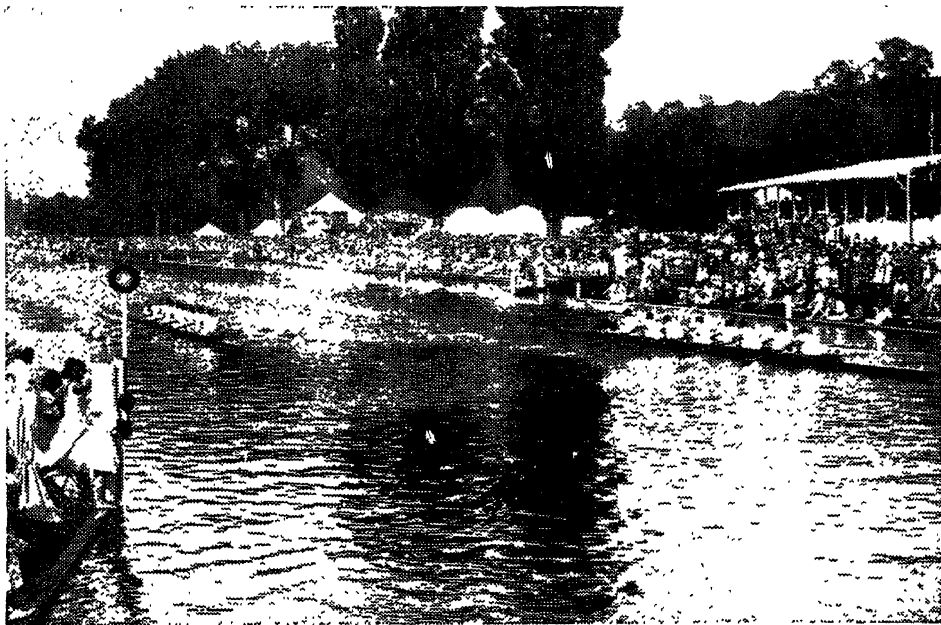
stitute Museum, and elsewhere in America.

**Henri, Robert** (1865-1929), American painter, was head of the New York School of Art, and exercised considerable influence among radical young artists. His works, represented in galleries throughout Europe and America, include *Spanish Gypsy* in the Metropolitan Museum of New York; *Laughing Girl* in the Brooklyn Institute Museum; and *Girl with Fan* in the Pennsylvania Academy of Fine Arts in Philadelphia.

**Henrietta, Cape**, Hudson Bay, Canada, at the w. entrance of James Bay. Lat. 55° 10' N.; Long. 82° 40' W.

circuit when the inducing current changes at the rate of one ampère per second, and the E.M.F. induced is one volt. See ELECTRICITY, CURRENT.

**Henry I.** (1068-1135), king of England, the younger son of William the Conqueror and Matilda. He succeeded his brother, William Rufus, in 1100, and strengthened his position by marrying Eadgyth (known as Matilda), daughter of Malcolm, king of Scotland. His charter of liberties, his recall of Anselm, and his arrest of Flambard testified to his prudence and sagacity. Normandy was united to England, and to defend himself



View during Henley Regatta.

**Henrietta Maria** (1609-69), the youngest daughter of Henry IV. of France and Marie de' Medici. She married Charles I. of England, who agreed, in the marriage contract, to relieve the English Catholics, but failed to effect the Queen's wishes. Between 1629 and 1639 she opposed Laud's proclamation against Roman Catholic recusants, and raised money for the royal cause in the bishops' wars (1639). She encouraged the army plot, attempted to save Strafford, and urged Charles to arrest the five members. From 1644 to 1660 she lived in France. See Taylor's *Life of Queen Henrietta Maria* (1905).

**Henry**, the practical electric unit of self-induction. It represents the induction in a

against the claims of the throne of his elder brother, Robert, Henry married his daughter, Matilda, to the Emperor Henry V. The Curia Regis, or King's Court, became the center of an administrative system by which the counties and the sheriffs were connected with the central government. The financial side of the Curia Regis, known as the Exchequer, was developed. A monastic revival took place during the reign, and the Austin canons and the Cistercians settled in England. See Freeman's *Norman Conquest*, vols. IV. and V. (1867-79), and Stubbs's *Constitutional History of England*, vol. I. (1891). See ANSELM.

**Henry II.** (1133-89), king of England, was the eldest child of Matilda, daughter of Hen-

ry I., and of Geoffrey Plantagenet, and succeeded Stephen as king in 1154. A vigorous, hard-working man, skilled in diplomacy, and a lover of the law, Henry revoked his predecessor's grants of crown lands, destroyed the 'adulterine' castles built by the barons, expelled all mercenaries, and abolished the 'fiscal' earldoms. To free himself from dependence on the barons, he took from them scutage in lieu of personal service for forty days (1159). In 1170 the Inquest of Sheriffs was followed by the dismissal of most of the sheriffs. The barons rose with the king's own sons, but the rebellion was speedily crushed by Henry II., who secured the passage of laws by which the baronial power was still further checked, the people were armed, and the king's supremacy over the forests firmly established. Henry's reign marks the development of the jury system, which was now used for judicial and financial matters. See Green's *Henry II.* (1888).

**Henry III.** (1207-72), king of England, the eldest son of John and Isabella, was crowned king of England, 1216. As Henry was only a child, England was governed till 1232 by ministers. Pious, and a lover of art and literature, Henry III. so far represented the age in which he lived; but he was faithless, wanting in energy, and irresolute. Consequently his reign was full of troubles. In 1236 Henry married Eleanor of Provence, and a host of Provençals invaded England. From this time the opposition of the clergy and barons became more and more pronounced. The crisis came to a head through Henry's acceptance of the crown of Sicily for his second son, Edmund. In 1258, a Parliament known as the 'Mad Parliament,' was called to Oxford, and from 1258-64 a struggle took place between the king and the barons resulting in the defeat of Henry who promised to accept the Provisions of Oxford giving more power to the barons. On Nov. 16, 1272, Henry III. died at Westminster, and was buried in the abbey. See Norgate's *England Under the Angevin Kings* (1887); id., *The Early Plantagenets* (1876).

**Henry IV.** (1367-1413), king of England, son of John of Gaunt, succeeded Richard II. in 1399. Henry's accession to the throne came after he had secured the abdication of Richard II. A rebellion broke out in Wales, but the Welsh were defeated. In 1405 Scrope, Archbishop of York, rebelled, but was easily overthrown; and in 1408, at Bramham Moor, the Percies were subdued. Meanwhile Henry had given Parliament considerable pow-

ers, and in 1407 the Commons gained the right of initiating money grants. Secure in the support of the church and of Parliament, Henry inaugurated a policy of opposition to the Lollards and an era of premature constitutional government. He lived in dread lest his son take his throne. See Wylie's *England under Henry IV.* (1884-98), and Stubbs's *Constitutional History of England* (1891).

**Henry V.** (1387-1422), king of England, son of Henry IV., whom he succeeded in 1413. The Lollard movement caused the government anxiety, and Henry continued his father's repressive policy. Meanwhile the ravage of privateers from Normandy made an invasion of France popular. Henry became regent of France, with the right of succession, and married the French princess Catherine. For the rest of his life Henry was occupied in Anglicizing Normandy, and in checking risings in France against the English predominance. See Kingsford's *Henry V.*, and Church's *Henry V.* (1889).

**Henry VI.** (1421-71), king of England, the son of Henry V., became king in 1422. During his long minority (till 1442) the Privy Council, under the control of Parliament, governed the country. The Duke of Bedford, Henry V.'s eldest brother, was regent in France; and Gloucester, his youngest brother, was made protector of the realm. Bedford made a league with the dukes of Burgundy. Then Orleans (1428-29) was saved by Jeanne d'Arc. Though Henry VI. was crowned in Paris, the conclusion of peace between Charles VII. of France and Burgundy of Bedford (1435), ruined the success of the English in France. In 1453, with the exception of Calais, there was total loss of the English possessions in France. In 1455 the wars of the Roses opened and during the rest of Henry VI.'s reign the Yorkists, or supporters of Richard, Duke of York, fought against the Lancastrians, or supporters of the ruling dynasty. Edward, York's eldest son, having won Mortimer's Cross, entered London (February 26), and was proclaimed king. In 1471 Henry VI. was murdered in the Tower of London. See Stubbs's *Constitutional History of England* (1891), and Green's *History of the English People* (several editions).

**Henry VII.** (1457-1509), king of England, the son of Edmund Tudor and Margaret Beaufort, succeeded to the crown after defeating Richard III. at the battle of Bosworth in 1485. In the following year he strengthened his position by marrying Eliza-

beth, daughter of Edward IV. To restore order, he enforced statutes against livery and maintenance, and set up a new court in 1487, known as the Court of Star Chamber, to keep down the nobles. Henry made an advantageous treaty with France 1491; and in 1496 he allied with Spain, without endangering his friendship with France. During his reign commerce and geographical enterprise were encouraged. His ministers and agents, such as Archbishop Morton, Empson and Dudley, played a notable part in raising money from the nobles, and the Star Chamber proved a most valuable instrument. See Lord Bacon's *History of Henry VII.* (1622), and Gairdner's *Henry VII.* (1889).

**Henry VIII.** (1491-1547), king of England, the second son of Henry VII. In 1509, the year of his accession, he married Catherine of Aragon, the widow of his brother Arthur. During those years (1509-29) foreign affairs engrossed most of the attention of the government. In 1527 a French alliance was brought about by Wolsey's efforts. Wolsey and the Pope were regarded by the king as responsible for his failure to obtain a divorce against Catherine, and Wolsey was exiled to his diocese of York. In 1529 the famous reformation Parliament met, and sat for seven years. Henry was now bent on securing the divorce at all costs. In 1533 Cranmer declared Henry's marriage with Catherine of Aragon invalid, and the king at once married Anne Boleyn. Parliament then passed a number of enactments completely abrogating the papal authority in England. In 1535 it passed the Act of Supremacy, making Henry supreme head of the Church of England. Henry was now absolute, and till the end of his life he pursued a course unrestrained by any constitutional checks. In 1536 Anne Boleyn was executed on the ground of conjugal infidelity. Henry then married Jane Seymour, and a son, afterwards Edward VI., was born in 1537.

Meanwhile the reformation movement advanced. In 1536 the lesser monasteries were dissolved, with the full assent of king and Parliament. This act roused great discontent but Henry set up the Council of the North, and began to dissolve the greater monasteries. Their wealth went, for the most part, into the pockets of the king and his friends. Henry now agreed with Cromwell that an alliance with the North German Protestant princes was desirable, and married in 1540 Anne of Cleves. Finding that this

marriage had been rendered unnecessary by the outbreak of war Henry divorced Anne of Cleves; and in July 1540 Cromwell, whose influence had long been declining, was executed. The party of Roman Catholic reaction thus triumphed and Henry married Catherine Howard, who was executed for conjugal infidelity. Henry then married Catherine Parr, who was a supporter of Protestantism. See Hall's *Henry VIII.*, in *Lives of Kings Series* (1904), and Hume's *The Wives of Henry VIII.* (1905); Hackett's *Henry the Eighth* (1927).

**Henry I.** (c. 1005-60), king of France, third son of King Robert I., ascended the throne in 1031. He granted Burgundy to his younger brother; he quarrelled with Robert, the powerful Norman duke, and when he invaded Normandy, was defeated at Mortemer (1054) and Varaville (1058).

**Henry II.** (1519-59), king of France, succeeded his father, Francis I., in 1547. His wife was Catherine de' Medici. His principal advisers were the Guises, and he greatly oppressed his Protestant subjects. His first war was with England in which he recovered Boulogne from the English. He was equally successful against the Emperor Charles V., and Calais was recovered (1558). In July 1559 Henry II. died in Paris, from a wound received at a tournament. See Ranke's *Civil Wars and Monarchy in France*, etc. (English trans. 1852-61).

**Henry III.** (1551-89), king of France, the third son of Henry II. and Catherine de' Medici, succeeded to the French throne in 1575. In 1573 he had been elected king of Poland. Civil war between the Huguenots and Catholics occupied most of his reign, which ended with Henry's assassination by Jacques Clément. See M. W. Freer's *Henry III.* (1858).

**Henry IV.** (1553-1610), king of France and Navarre, third son of Antoine de Bourbon, Duke of Vendôme, and Jeanne d'Albret of Navarre and Béarn became king of Navarre in 1562. He married Marguerite of Valois, sister of Charles IX. of France. On the death of Henry III. Henry of Navarre became (1589) the lawful king of France. In 1598 Henry granted to the Huguenots the Edict of Nantes. The wars had left France in an exhausted condition, and Henry's great minister, Sully, did much to restore its prosperity. He imposed new taxes, he enforced economy, he encouraged agriculture, while Henry introduced the silk industry into France. On April 14, 1610, Henry was assassinated.

minated at Paris by Ravallac. See Baird's *The Huguenots* and *Henry of Navarre* (1886), Willert's *Henry IV.* (1893).

**Henry V. of France.** See **Chambord, Comte de.**

**Henry II.** (1333-79), king of Castile, natural son of Alfonso IX., better known as Henry of Trastamare, was defeated by the Black Prince at Najera in 1367, when trying to recover the throne from Peter the Cruel; but he won it by the battle of Montiel (1369), after which Peter was killed.

**Henry III.** (1379-1406), king of Castile, grandson of Henry II., reigned from 1390. He lessened the power of the nobles, and maintained order in his kingdom. He married Catherine of Lancaster.

**Henry I.,** German emperor (919-936), born about 876, was Duke of Saxony, usually known as Henry the Fowler, and succeeded the Emperor Conrad I. After subduing various Slav tribes in N. Germany (927-928), and exacting tribute from the Duke of the Bohemians (929), he repelled a strong invasion of the Hungarians (933), and made his power felt in Denmark (Schleswig).

**Henry II.,** German emperor (1002-24), great-grandson of Henry I., was born in 973. He was Duke of Bavaria when he was chosen to succeed Otto III. In 1004 he became king of Italy, and in 1014 was crowned emperor at Rome. His reign was occupied with wars both at home and abroad, in which he was finally successful. See Cohn's *Kaiser Heinrich II.* (1867).

**Henry III.,** German emperor (1039-56), the son of the Emperor Conrad II., was born in 1017. He was a zealous supporter of clerical power, and greatly fostered learning. It was he who built the cathedrals at Worms, Spire, and Mainz. Four successive popes (Clement II., Damasus II., Leo IX., and Victor II.) owed their election to his influence. See Steindorff's *Jahrbücher des deutschen Reichs unter Heinrich III.* (1874-81).

**Henry IV.,** German emperor (1056-1106), son of Henry III., was born in 1050, and ascended the throne under the regency of his mother, Agnes of Poitou. The severest struggle of his reign was against the energetic and ambitious Pope Gregory VII. (Hildebrand), who in 1076 excommunicated Henry; and it was only by personally humiliating himself, in sackcloth and barefoot, for three days, outside the castle of Canossa (January, 1077) in Italy, that the emperor was able to get the papal ban removed. Meanwhile the German princes elected a suc-

cessor to Henry in Rudolf of Swabia; but Rudolf fell in battle (1080), and the emperor, in spite of a second ban of excommunication, not only set up a rival Pope (Clement III.), but marched into Italy, and had himself crowned emperor by Clement III. From 1093 to the end of his reign he was engaged in renewed strife, first against the successors of Gregory VII., and secondly against the hostile princes in Germany, who won over to their side Henry's own sons, Conrad and Henry, the latter of whom forced him to abdicate. See Floto's *Heinrich IV.* (1855-7).

**Henry V.,** German emperor (1106-25), son of Henry IV., was born in 1081. Although he had gained the crown with the help of the papal party, Henry nevertheless continued the struggle, until the investiture dispute was definitely settled by the Concordat of Worms (1122), the Pope securing the right to nominate the great ecclesiastics, and the emperor the right to grant them investiture of their temporal possessions. See Gervais's *Geschichte Deutschlands unter Heinrich V.* (1841).

**Henry VI.,** German emperor (1190-7), was born in 1165, the son of Frederick I. Barbarossa, and Constance, heiress to the kingdom of Sicily. One of the main objects of his policy was to make himself master of that island. Another was to abolish the elective character of the imperial sovereignty, and have it declared hereditary in his own family. Both objects failed of realization. See Toeche's *Kaiser Heinrich VI.* (1867).

**Henry VII.,** German emperor (1308-13), son of the Count of Luxemburg, was born in 1269. He died in Italy, whither he had gone to establish the imperial authority, disputed by the Pope, and by the Anjou dynasty in Naples.

**Henry, Alexander** (1739-1824), American fur trader, born in New Brunswick, N. J. He was one of the first to receive from the English authorities permission to engage in the fur trade, and was the first English trader beyond the Ottawa. In 1796 he abandoned the fur trade and was thereafter leading merchant in Montreal. He wrote *Travels and Adventures in Canada and the Indian Territories between the years 1760 and 1776* (1809; new ed. 1901), considered to be the best account of the beginnings of the English fur trade in the northwest.

**Henry, Joseph** (1799-1878), American scientist, developed the electro-magnet; worked out the principle of the telegraph relay instrument; made many improvements

in the mechanism of lighthouses and fog-signals; and carried on researches in terrestrial magnetism, acoustics, and meteorology. He had a controversy with Morse as to which of them was the inventor of the electric telegraph. See *Smithsonian Miscellaneous Collections* for papers and biography.

**Henry, O.**, pseudonym of William Sydney Porter (1862-1910), American writer of short stories. He knew people in the lower walks of life from having associated with them in the South, the Southwest, New York City and elsewhere. He wrote brilliantly and prolifically of these people in stories which attained amazing popularity. His volumes of short stories include *Cabbages and Kings*, *Options*, *The Gentle Gifter*, and *Rolling Stones*. Consult Smith's biography of O. Henry (1916).

**Henry, Patrick** (1736-99), American orator and statesman. At school Patrick was an apt scholar and later he demonstrated his incapacity for business, and finally, after a brief course of study, was admitted to the bar (1760). As a lawyer he was almost immediately successful; and in 1763 he acquired sudden fame as an orator and greatly increased his practice by a radical speech in a celebrated case known as the 'Parson's Cause.' Throughout the period immediately preceding the Revolutionary War, he was an ardent leader of the opposition in Virginia to the aggressions of the home government; he was an influential member of the Continental Congress; and in 1775, before Virginia's second Revolutionary Congress, he urged the immediate arming for war of the Virginia militia, in a ringing speech, often quoted and declaimed, and closing with the words, 'Is life so dear or peace so sweet as to be purchased at the price of chains and slavery? Forbid it, Almighty God! I know not what course others may take, but as for me, give me liberty or give me death!' He helped to frame a state constitution, was governor of Virginia and sat in the legislature. He declined to serve as a member of the Constitutional Convention of 1787, and led, with all his ability and fiery eloquence, the opposition to that instrument. Thereafter he declined various high offices to which he was appointed. Henry was, Webster alone excepted, probably the greatest of American orators, and at the same time was an able and farseeing statesman. See M. C. Tyler's *Patrick Henry* (1887; new ed. 1899), and W. W. Henry's *Patrick Henry; Life, Correspondence, and Speeches* (1890-91).

**Henry, William** (1774-1836), English chemist and physician, discovered the law of solubility of gases, known as 'Henry's law'; wrote *Elements of Experimental Chemistry* (11th ed. 1829), remarkable for accuracy in facts and literary elegance. He was Copley medallist of the Royal Society in 1808.

**Henry, Fort.** See *Donelson, Fort*, and *Henry, Fort*.

**Henry of Lancaster**, First Duke of Lancaster (?1299-1361), son of Henry, Earl of Lancaster (?1281-1345), in early life was a crusader, and also served in the Scottish wars of 1333 and 1336. With Edward III. he distinguished himself in France (1345-6), and on his return to England was one of the original knights or founders of the order of the Garter. In 1351 he was created Duke of Lancaster.

**Henry, Prince of Prussia** (1726-1802), was born in Berlin, the brother of Frederick the Great, who described him as the only general who made no mistakes during the Seven Years' War.

**Henry, the Lion** (1129-95), Duke of Saxony and Bavaria, was the son of Duke Henry the Proud, and a cousin of the Emperor Frederick Barbarossa. He married Matilda, daughter of Henry II. of England. Henry founded Munich, and encouraged the development of Hamburg, Lübek, and other towns.

**Henry, the Minstrel, or Blind Harry** (fl. 1450-92), the supposed author of an epic poem, *The Life of that Noble Champion of Scotland, Sir William Wallace, Knight*, obtained his livelihood by recitation of poetic stories about Wallace. The name, 'Blind Harry,' occurs in Dunbar's famous *Lament for the Makaris* (1508). According to John Major, *The Whole Book of William Wallace* was composed about 1450-60. A modernized version by William Hamilton of Gilbertfield (1722) attained remarkable popularity among the peasantry of Scotland. Consult T. F. Henderson's *Scottish Vernacular Literature* and Millar's *Literary History of Scotland*.

**Henry the Navigator** (1394-1460), Portuguese prince, son of John I., King of Portugal, devoted himself to the development of navigation and the fostering of maritime expeditions. In 1440 Cape Blanco was reached, in 1446 Cape Verde, and in 1448 the Azores. He built an observatory and a school of discovery at Sagres, near Cape St. Vincent. Consult Major's *Discoveries of Prince Henry the Navigator* and Beazley's *Henry the Navigator*.



**Henryson, Robert** (?1430-1506?), Scottish poet. His long allegorical poem, *Orpheus and Eurydice*, was printed in 1508. The first complete edition of his fables is *The Poems and Fables of Robert Henryson*, edited by David Laing (1865). His most unique and perfect performance is, perhaps, *Robene and Makeyne*, a humorous tale of rustic courtship, while his more characteristic qualities are best manifested in his *Moral Fables* (1570), paraphrased from Æsop.

**Henschel, Sir Georg** (1850-1934), German English baritone singer, composer, and conductor. He won success in London in 1877. In 1881-4 he conducted the Boston Symphony Orchestra, and with his first wife, Lillian Bailey, a noted American soprano, toured the United States. He was the conductor of the London Symphony Concerts. His compositions include songs, vocal studies, a *Requiem Mass*, *Stabat Mater* (1894), *Te Deum*, an opera *Nubia* (1899), and a comic opera (1899).

**Henselt, Adolf von** (1814-89), German musical composer, is chiefly known by his scholarly arrangements of Weber's works. Among his best known compositions are *Poème d'Amour*, op. 3, and the *Ballade*, op. 31.

**Henson, Josiah** (1787-1883), American negro clergyman, was born in Port Tobacco, Md. Bred as a slave, he escaped and made his way to Canada, where he became a Methodist minister. While in England, he was entertained at Windsor Castle by Queen Victoria. He told Harriet Beecher Stowe the story of his life, and upon it she partly based her famous book, *Uncle Tom's Cabin*.

**Henty, George Alfred** 1832-1902), English author, served with the British forces in the Crimea. He witnessed the Italo-Austrian War; was with Garibaldi in the Tyrol; went with the Prince of Wales to India; and accompanied the armies in the Franco-Prussian and the Turko-Serbian wars. He wrote more than seventy books for boys.

**Hepatica**, a name given to certain ranunculaceous plants, sometimes regarded as constituting a separate genus, sometimes as belonging to the genus *Anemone*. The plants are hardy, of low growth, and flower in early spring, the flowers resembling a buttercup in form, but in color varying through shades of white, blue, and red. Liver Leaf is the most common American species, with flowers ranging from dark blue to white in hue.

**Hepaticæ.** See **Liverworts**.

**Hepburn, Alonzo Barton** (1846-1922),

American banker, was connected with the Chase National Bank of New York from 1899 to his death. He was also chairman of the currency commission of the American Bankers' Association and a director in many important financial and mercantile firms. He is the author of *History of Coinage and Currency* (1903); *Artificial Waterways and Commercial Development* (1909); *Story of an Outing* (1913); *A History of Currency in the United States* (1915).

**Hepburn, Katherine** (1909- ), actress. Her first professional appearance was in 1928. Her first major success came in *The Warrior's Husband*. She achieved her greatest success in 1933 in the motion picture *Little Women*. Pictures in which she has appeared are: *Spitfire*, *The Little Minister*, *Alice Adams*, *The Philadelphia Story*. In 1937 she returned to the legitimate stage to play the lead in *Jane Eyre*.

**Hephæstus**, identified by the Romans with their god Vulcan, was in Greek mythology the god of fire, and of all the arts, especially the workings of metals which depend on the use of fire. He was the son of Zeus and Hera. Because of his lameness, he was the laughing-stock of the other gods, and was so disliked by Hera that she cast him forth from heaven. In the *Odyssey* his wife is Aphrodite, who betrayed him for Ares.

**Heptarchy**, the name sometimes applied to the seven kingdoms supposed to have been established by the Saxons in England.

**Hera**, called Juno by the Romans, was in Greek mythology the wife and sister of Zeus, and the patroness of marriage and childbirth. Homer ascribes to her a jealous, quarrelsome, and obstinate disposition. She pursues with unrelenting hatred the mistresses of Zeus and their children, especially Hercules and Dionysus, and even plots with Poseidon and Athena to put Zeus in fetters, for which she is punished by him.

**Heracleia**, the name of several ancient Greek towns.

**HERACLEIA IN LUCIANA**, in Southern Italy, on the northwestern coast of the Tarentine Gulf, was founded, probably in 432 B.C. The city disappeared during the middle ages. Near it was found the *Tabulæ Heracleenses*, bronze tablets inscribed with municipal regulations, according to Julius Cæsar's law of 45 B.C.

**HERACLEIA**, called **MINOA**, a Greek colony on the southern coast of Sicily, established by Selinus, was seized by Euryleon of Sparta, who changed its name to Heracleia.

**HERACLEIA PONTICA** (now Eregli), in Bi-

thynia in Asia Minor, was a colony from Megara; people of Tanagra in Bœotia also shared in its foundation.

**Heraclian**, a Roman general, is first mentioned in 408 A.D. as having with his own hand killed Stilicho. As a reward he was appointed count of Africa. Kingsley introduces him into *Hyppatia*.

**Heraclidæ**, the sons of Heracles, who according to Greek tradition invaded the Peloponnesus, but were forced to agree to abstain from invading the land for the next fifty years. At the expiration of that time the descendants of Heracles successfully invaded the Peloponnesus, about 1050 B.C.

**Heraclitus**, of Ephesus (c. 576- c. 480 B.C.), early Greek philosopher of the Ionian school. Zeller calls him 'the first philosopher who emphatically proclaimed the absolute life of nature, the ceaseless change of matter, the variability and transitoriness of everything individual; and, on the other hand, the unchangeable equality of general relations, the thought of an unconditioned, rational law governing the whole course of nature.' Because of his laments over the folly of mankind, Heraclitus was known as 'the weeping philosopher,' in contradistinction to the laughing Democritus. His *Fragmenta* were edited by Bywater (1877). Consult Patrick's *The Fragments of the Work of Heraclitus*.

**Heraclius**, emperor (610-641), of Byzantium. By a display of force and by bribery, he concluded a treaty with the barbarian Avars (620), and then turned against the Persians. In a series of campaigns he rolled back the tide of the Persian invasion, recovered the true cross, and thus made the task of Mohammed so much the easier.

**Herald**, an officer of state whose duties formerly comprised the regulation of armorial bearings, the ordering of tournaments, trials by combat, the arrangement of state ceremonies, processions, etc., and the bearing of royal messages. In modern times his principal functions are the devising and granting (under the sovereign) of coats-of-arms, the authentication of pedigrees, making royal proclamations; and taking part in the pageantry of coronations, etc.

**Heraldry**. For popular purposes, the words armory and heraldry may be considered as identical. Disregarding speculations as to the origin of the science, it will suffice to say that in the 13th century heraldry was, in Britain, in possession of a system and nomenclature of its own, and that these have

been transmitted with little or no change to the present day.

*Shape of Shield*.—The coat-of-arms consists of depictions on a shield varying in shape from that of a kite to that of an almost square form.

*Rules of Blazon*.—The surface of the shield is termed the field, and may be of one or more colors. That which is borne on the shield is called the charge, and the field and charge together form the coat-of-arms. The coat-of-arms, with its exterior ornaments, including the supporters, the helmet, the livery colors, the crest, mantle, and mantling, is termed the achievement. To describe a shield and the bearings upon it, with their positions and colors, in concise and unambiguous technical language, so that it may be possible to reproduce the same accurately from the description, is to blazon the coat. In heraldry the written word is the law. Beginners will find it a good rule to write out the names of the tinctures in full.

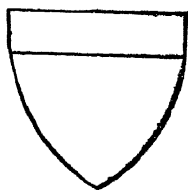
*Metals, Colors, and Furs*.—Metal is not to be placed upon metal, color upon color, or fur upon fur, as a rule.

*Points of the Shield*.—The shield has a dexter and sinister side, so called from their position in relation to the imaginary bearer. It follows that the dexter or right-hand side of the shield is opposite the left hand of the spectator, and the sinister or left-hand side of the shield opposite the right of the spectator.

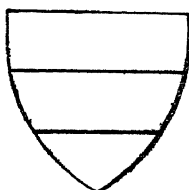
*Partition Lines*.—These lines, otherwise termed dividing or border lines, are distinguished according to their form. The straight lines are perpendicular, horizontal, or diagonal.

*Ordinaries and Subordinaries*.—These are the conventional figures in heraldry most frequently in use. They have been so subdivided for purely fanciful reasons, and no two authorities agree as to the exact classification. But since Nisbet's time they have formed the basis of all text-books on the subject.

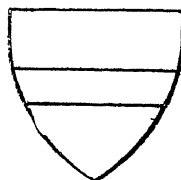
*Charges on Shields*.—These are conveniently divided into animate and inanimate. The former class includes (1) the fabled monsters of heraldry; (2) man and his parts; (3) all other divisions of the animal kingdom. Monsters are really of infrequent occurrence in British coats. The griffin, half-eagle and half-lion, with huge ears, a combination supposed to represent wisdom and fortitude, is represented either as rampant, passant, or salient. The dragon, a winged monster with a grif-



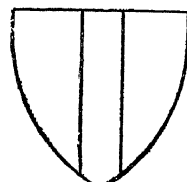
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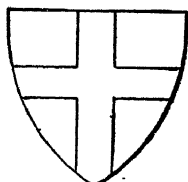
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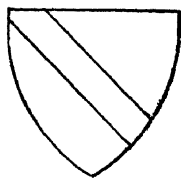
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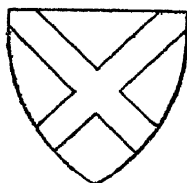
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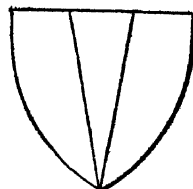
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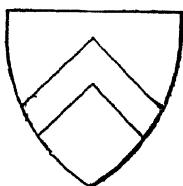
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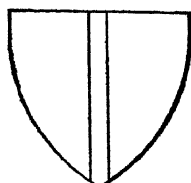
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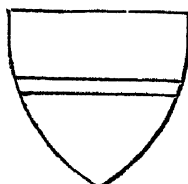
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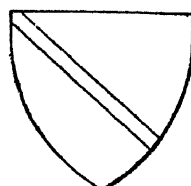
THE CHEVRON



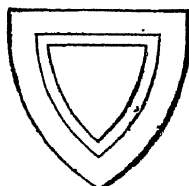
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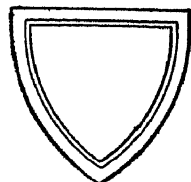
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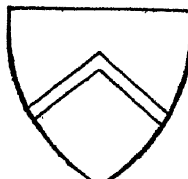
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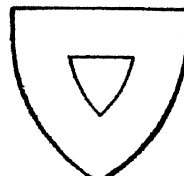
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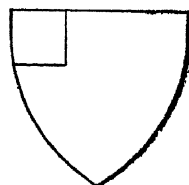
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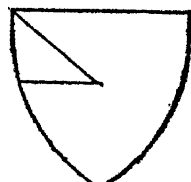
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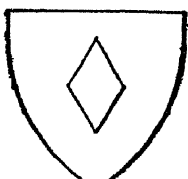
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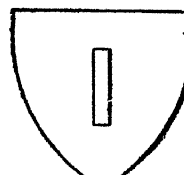
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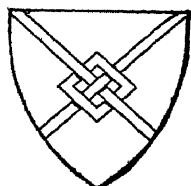
THE GYRON



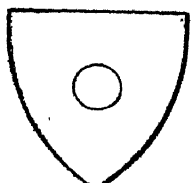
THE LOZENGE



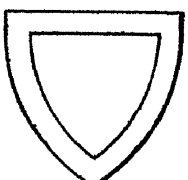
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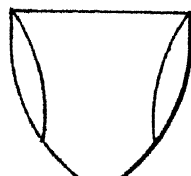
THE FRET



THE ROUNDAL



THE BORDURE



FLAUNCHES

*Heraldry. Ordinaries and Subordinaries.*

fin's head, a body with four legs, huge claws, and barbed tongue and tail; the wyvern, a two-legged dragon; the cockatrice, a wyvern with the head of a cock, are all occasionally met with. The unicorn, with the body of a horse, the beard of a goat, a long spiral horn springing from the middle of the forehead, and cloven hoofs, is familiar as one of the royal supporters. *Man.* The old ecclesiastical seals furnish us with numerous examples of saints. The eye, the arm, and the leg have all been pressed into service. *Beasts.* The earliest example yet brought to light of the lions of England is on the great seal of Richard I. (1198), which gives three lions passant guardant in pale. The lion rampant appears on the great seal of Alexander II. of Scotland (1229). The lion is blazoned in various attitudes—rampant, passant, passant guardant, statant, salient, sejeant, or couchant. The elephant, horse, boar, bear, wolf, dog, fox, deer, hare, otter, bull, sheep, and even the rabbit, appear in arms. *Birds.* The eagle appears as a heraldic bearing early in the 12th century. In England the examples of its use are numerous. In Scotland it is mainly carried by families of Celtic origin. The hawk, the heron, and the crane, the raven and the cock, are of frequent occurrence. *Fish.* The dolphin, the device of the heir to the throne of France, is carried by many British families. Coming lower down the scale of creation, we find serpents, blazoned as gliding or nowed, tortoises, frogs, tadpoles or powets, snails, worms, ants, bees, butterflies, and spiders.

The inanimate charges:—1. *Natural.* (a) Astronomical. Azure, the sun in his glory is the coat of augmentation of the marquessate of Lothian. The moon when borne full is said to be in her complement, but she is usually represented by the half-moon or crescent. The mullet is a star of five points; the star is a figure of six or more points, straight or waved, but if of more than six points or if waved, to be so blazoned. Comets, thunderbolts, rainbows, and clouds also occur. (b) Terrestrial. Include such charges as mountains, rocks, rivers, wells, and caves. (c) The vegetable kingdom. Trees occupy an important position in heraldry. The O'Connor Don in Ireland bears, argent, an oak tree vert; and Macgregor in Scotland, argent, a fir tree growing out of a mount in base vert, surmounted of a sword in bend supporting an imperial crown proper. The oak, fir, and pine are most usually met with in our blazons. Palms also occur, and branches, leaves,

and the fruits of the earth in endless variety from the pineapple downward. 2. *Artificial charges* may here be classified as they relate to military, ecclesiastical, or civil life. In the first class are comprehended castles, mural crowns, and implements of war, as swords, spears, and armor. Nautical charges include naval crowns, ships, lymphads, anchors, etc. Ecclesiastical charges embrace the crosier, the mitre, the keys, and similar adornments. All other charges the representation of the handiwork of man not strictly embraced within the two preceding classes, from the sleeve of a woman's gown, termed in heraldry a maunch, to padlocks and gridirons, come under the third class.

*Marshalling* is the arranging of two or more coats in one shield. The earliest method of displaying an alliance was by placing the arms of a husband and wife side by side in separate shields. Quartering came into use in the 13th century. Where two coats were to be quartered, the husband's were generally placed in the first and fourth quarters, and the wife's in the second and third. Official arms, such as those carried by archbishops, bishops, and abbots impaled, first, the arms of their sees or abbeys, and second, their paternal arms.

*Augmentations* are additions made by the sovereign to the arms of an individual, as a recognition of public services. Thus, Henry VIII., in respect of the encounter at Flodden Field in 1513, granted to Thomas Howard, Earl of Surrey, afterwards Duke of Norfolk as a special mark of honor, the augmentation following, on an escutcheon or, a demi-lion rampant pierced through the mouth with an arrow within a double tressure flory counter-flory gules.

*Arms of Dominion.*—The most distinguished example is the coat of His Majesty King Edward VII., first and fourth England, second Scotland, third Ireland. In Scotland the blazon is first and fourth Scotland, second England, third Ireland, with the appropriate differences in the supporters and other exterior ornaments of the shield.

In the arms of princes and peers the coronets befitting the various degrees are placed above the shield, the helmet on the coronet. The *wreath* or *torse* lies on the crest of the helmet, and consists of the livery colors, being the tinctures of the ground and of the principal charge in the shield. On the wreath is placed the *crest*, a fashion said to have come in with the 14th century, but it is in fact almost as old as the use of the helmet it-

self. Crests ought to bear some allusion to the arms, however remote. On a scroll above the helmet is the motto, whose inward meaning is generally a puzzle to the outsider. Sometimes the motto is underneath. All mottoes have a real or fancied reference to the arms. That is why it is depraved heraldry to have more than one motto. The *lambrequin*, or mantling, is a painter's device. It is represented as attached to the helmet and flowing down either side of the shield. Its treatment varies as the idea of the draughtsman is gro-



*Complete Armorial Bearings  
(Arms of the Earl of Rosebery).*

1. Motto. 2. Crest. 3. Wreath.
4. Helmet. 5. Lambrequin. 6. Coronet. 7. Shield, quartered.
8. Mantel.

tesque or graceful. The *mantle* is the robe forming the background, repeating on its folds or laps the arms in the shield.

**Who may bear arms.**—No statutory definition of the classes who may, in England or Ireland, apply to the proper officers for a title to bear arms appears to have been issued. In Scotland, by an Act of Parliament passed in 1672, the Lord Lyon is entitled to grant arms to all virtuous and well-deserving persons; and the practice of granting coats armorial to suitable applicants is believed to be fairly uniform in the various heraldic courts of the kingdom. Grants may be applied for through any officer of arms.

The books of real use to the student are comparatively few in number. They comprise Woodward and Burnett's *Heraldry, British and Foreign, with English and French Glos-*

*series* (2 vols. 1892; 2d ed. 1896); Parker's *Oxford Glossary* (2d ed. 1894); Boutell's *Heraldry* (1874); Elvin's *Dictionary of Heraldry* (1889). See also Crozier's *General Armory*; *Register of American Families Entitled to Coat Armor* (1904); Grant's *Manual of Heraldry* (1924); and Burke's *Genealogical and Heraldic History* (1925).

**Herat**, cap. of W. Afghanistan, some 50 m. from the Russian and Persian frontiers. Founded by Alexander the Great, and now regarded as the 'gateway' to Afghanistan and India, the town is well fortified; p. estimated at 25,000.

**Hérault**, department in s. of France, between the Cevennes and the Mediterranean. Area, 2,400 sq. m. Hérault is a rich agricultural department, producing much wine. Silkworms are bred. Salt is produced along the seashore. Among the minerals are zinc and coal. Stone, marble, and lime are quarried. The department contains numerous health resorts. Montpellier, the capital, has population of 82,819.

**Herbal**, a book containing the names and descriptions of herbs, or of plants in general, which have medicinal properties. The chief works so named are *The Grete Herbal* (1526); R. Dodoens's *A Nieuwe Herbal*; Turner's *New Herbal* (1551); Gerarde's *Herbal* (1597); and Parkinson's *Theatrum Botanicum* (1640). The word herbal is also used to signify a collection of herbs or plants.

**Herbarium** (or, less usually, *hortus siccus*), a collection of dried plants preserved for comparison and study. The method of preservation is to dry the specimens between sheets of absorbent paper, under pressure, and mount them on stiff paper of uniform size. Some plan should govern the collection—the illustration of a botanical problem, the flora of a given district, variations, etc. One of the most famous is the Gray Herbarium at Harvard University, which contains many of the typical plants upon which the older collectors, including Asa Gray himself, based their classifications. Another is that of the New York Botanical Garden, which is constantly and rapidly growing.

**Herbart, Johann Friedrich** (1776-1841), German philosopher, studied at Jena under Fichte. His metaphysical system has a certain resemblance to that of Leibniz, in that he regards the universe as a plurality of ultimate and independent units. Apart from its metaphysical basis, his psychology resembles that of the English associationists, though he goes beyond them in attempting to express psy-

<i>Metals.</i>	<i>Tincture.</i>	<i>Represented by.</i>
Gold.	Or.	Dots irregularly disposed.
Silver.	Argent.	Shield a blank.
<i>Colors.</i>	<i>Tincture.</i>	<i>Represented by.</i>
Blue.	Azure.	Horizontal lines.
Red.	Gules.	Perpendicular lines.
Black.	Sable.	Perpendicular and horizontal lines crossing each other.
Green.	Vert.	Diagonal lines from right to left.
Purple.	Purpure.	Diagonal lines from left to right.
Tenné.	Orange.	Lines in bend sinister crossed by other bar ways.
Sanguine.	Blood-color.	Lines in saltire.
<i>Furs.</i>	<i>Tincture.</i>	
Ermine.	White, powdered with black spots.	
Ermines.	Black, with white spots.	
Pean.	Black, with gold spots.	
Erminois.	Gold, with black spots.	
Vair.	Rows of small escutcheons colored (generally) alternately azure and argent.	

*Table of Heraldic Symbols.*

chological processes in terms of mathematical formulæ. His psychology was the most effective part of his system. Through the doctrine of apperception in particular, the Herbartian psychology has exercised a powerful influence on educational theory and practice. His *Sämmtliche Werke* appeared in 12 vols. (1850-52). See A. Darroch's *Herbart and the Herbartian Theory of Education* (1903); Adams's *The Herbartian Psychology Applied to Education* (1898).

**Herbert, Edward, Lord Herbert of Cherbury** (1583-1648), English philosopher, historian, and diplomatist. Herbert's chief work is the *De Veritate* (1624), to the third edition of which (1645) were appended short treatises, *De Causis Errorum* and *Religio Laici*. The *De Religione Gentilium*, a verification of his theological views in the field of comparative religion, was published at Amsterdam in 1663. The *Dialogue between a Tutor and his Pupil* (1768) re-states and enforces his religious views in a popular way. Herbert was the first to make a systematic attempt at a comparative study of religions; but he looked upon all historical religions as corruptions of the pure and primitive rational worship. His views largely determined the deistical movement of the 18th century. In the second place, he was the first writer who anticipated the critical method by means of which Kant long afterwards gave a new direction to modern thought, emphasizing the importance of the inquiry into knowledge.

Herbert takes universal consent as the highest criterion of truth.

**Herbert, George** (1593-1633), younger brother of Lord Herbert of Cherbury, was an English poet. In 1630 he was given the living of Bemerton, near Salisbury. Here he wrote his courtly and spiritual religious poetry, which before his death he sent to his friend, Nicholas Ferrers, to be published or burned. Works: *The Temple* (1633); *Jacula Prudentum* (1640); *The Country Parson* (1652, etc.); *English Works, newly arranged by Palmer* (1905); See *Life* by Isaak Walton (1670); *Palmer's Bibliography* (1911).

**Herbert, Henry William** (1807-58), American novelist, born in England. He established the *American Magazine* in 1833. Generally under the name of Frank Forester, he wrote many books on shooting, fishing, and adventure connected therewith, such as *The Field Sports of the United States and British Provinces of North America*, illustrated by himself (1848); *Complete Manual for Young Sportsman* (1852), and so on. He also published *Cromwell* (2 vols., 1837); *The Roman Traitor* (2 vols., 1846); *The Puritans of New England* (1853); *The Chevaliers of France* (1853); and others.

**Herbert, Sir Michael Henry** (1857-1902), English ambassador, was chargé d'affaires at Washington (1888-89); secretary to the legation at Washington (1892-3). The same position was held by him at The Hague (1893-4), at Constantinople (1894-7), and at

Rome (1897-8). From 1898 to 1902 he was secretary to the British embassy at Paris, and in 1902 was appointed British ambassador at Washington.

**Herbert, Sir Robert George Wyndham** (1831-1905), English statesman, born at Brighton, and educated at Eton and Oxford, where he became a fellow of All Souls. His public career began in 1855 as a private secretary to William E. Gladstone; and in 1859 Sir George Bowen, the first governor of Queensland, persuaded him to accompany him there. On the formation of the first ministry Sir Robert took office, and from 1860 to 1865 was prime minister of the colony. He returned

*Mill; Naughty Marietta; The Wizard of the Nile; The Serenade; and Happyland*, all comic operas.

**Herbert, William**, third Earl of Pembroke of the second creation (1580-1630). A poet, and lord chamberlain to James I., he has sometimes been identified as the 'Mr. W. H.' to whom Shakespeare's *Sonnets* were inscribed, and who was one of the dedicatees of the first folio.

**Herbivora**, in zoology, a term formerly used to designate the hoofed animals on account of the nature of their diet.

**Herculaneum**, ruined city of Italy, lay at the w. foot of Mount Vesuvius, near Na-



*A street of Herculaneum recently excavated.*

to England in 1868; was permanent under-secretary of state for the Colonies (1871-92), and agent-general for Tasmania (1893-6). His practical knowledge of colonial affairs and conditions, and his delicate and tactful methods, stood him in good stead through a time of transition from autocratic colonial government to almost complete independence. He was a strong supporter of the policy of preference and tariff reform.

**Herbert, Victor** (1859-1924), American musical conductor and composer, born in Ireland. His music is chiefly of the light opera type and has enjoyed much popularity. He was conductor of the Pittsburgh Orchestra from 1898 to 1904, when he organized his own orchestra in New York city. His compositions include *Babes in Toyland; Red*

*ples*. It was overwhelmed by eruptions of the volcano in 63, 79, and 472. The ancient city was accidentally discovered in 1711-19, and excavations have been carried on, but intermittently, since 1737. Most of the treasure-trove, papyrus MSS., vases, and domestic utensils, are now in the museum at Naples.

**Hercules**, called **Heracles** by the Greeks, the greatest of the legendary heroes of Greece, was the son of Alcmena, wife of Amphitryon, king of Thebes, by Zeus. As he lay in his cradle, Hera, who was his lifelong enemy, sent two serpents to kill him, but with the supernatural strength with which he had been endowed by Zeus, he strangled them with his hands. With a blow of his lyre he killed his master, Linus, for finding fault with him; whereupon Amphitryon sent him to feed his

cattle. While so doing, Hercules slew a huge lion which ravaged the flocks. Next he killed Erginus, king of Orchomenus, who used to exact tribute from Thebes. Some time later, driven mad by Hera, he slew his children, and some say his wife, Megara, as well.

After a period of insanity he sought the aid of the Delphic oracle, which ordered him to settle at Tiryns for twelve years, and to perform the tasks imposed on him by Eurystheus. These tasks were the famous twelve labors:—the slaying of the Nemean lion, which infested the valley between Cleonæ and Phlius; the slaying of the hydra or water-snake of Lerna, a swamp near Argos; the capture of the Arcadian stag, which had golden antlers and bronze hoofs; the capture of the boar of Erymanthus, which he brought alive to Eurystheus; the cleansing of the stables of Augeas in a single night, by turning the rivers Alpheus and Peneus through them; the slaying of the Stymphalian birds, monsters with brazen claws and beaks, which dwelt on a lake near Stymphalus in Arcadia; the capture of the mad Cretan bull, which Poseidon had sent to Minos; the capture of the mares of the Thracian Diomedes, king of the Bistones, which ate human flesh; the seizure of the girdle of Hippolyte, queen of the Amazons; the capture of the oxen of Geryon, king of Erythia; the quest of the golden apples, guarded by the Hesperides, to obtain which Hercules held up the heavens on his shoulders while Atlas fetched them; the rape of Cerberus, the dog of hell, from the lower world. Further, he is said to have fought with the Centaurs, and defeated them; though in his pursuit he accidentally killed his friend Chiron.

On his return from the country of the Amazons Hercules continued his remarkable adventures. At last Deianeira, his wife, fearing that Iole would supplant her, sent Hercules a shirt steeped in the blood of the Centaur Nessus. When Hercules put it on, the poisonous blood entered his frame and caused him extreme agony, he tore it off with pieces of his own flesh, and was brought to Trachis in a dying state. Deianeira thereon hanged herself. When his funeral-pyre was burning, a cloud descended and bore him away to Olympus, where he became a god and wedded Hebe.

Hercules was especially honored by the Dorians; the royal houses of Argos, Sparta, and Messene all traced their descent from him. He was also much worshipped at Rome. The founding of the Olympic games was

attributed to him. The most notable statue is the so-called Farnese Hercules, found in the baths of Caracalla in 1599, and now in the museum at Naples.

**Hercules**, an ancient constellation, between Ophiuchus and Draco. Cerberus and the Apple-Branch, reminiscent of the fruits of the Hesperides, are comparatively modern adjuncts to the constellation.

**Hercules, Pillars of**, the two rocks which form the western entrance to the Mediterranean Sea. Calpe (the Rock of Gibraltar) and Abyla (Ceuta). Ancient authorities considered that the pillars were rocks torn asunder by Hercules, so as to open the Atlantic Ocean into the Mediterranean; others, that he once joined them to make a bridge, or fixed them to narrow the strait and to exclude the monsters of the ocean.

**Hercules Beetle**, a beetle belonging to the same family as the goliath beetle, remarkable for its large size, the male sometimes reaching a length of over five inches. It is a native of the West Indies and of tropical America. The male bears on the thorax an enormous horn, which is met by a shorter upturned horn from the head, the whole resembling a pair of large but somewhat unequal pincers.

**Hercynian Forest**, anciently the wooded mountainous region lying n. of the Lower and Middle Danube. In modern geography the name designates the mountains of Central Europe from the Carpathians to Prussia.

**Herder, Johann Gottfried von** (1744-1803), German writer. In 1771 he was at Strassburg, where he exerted considerable influence on Goethe.

Many of Herder's works are theological and philosophical; he became a violent opponent of Kant. His *Ideen zur Philosophie der Geschichte der Menschheit* (1784-91; Eng. trans. 1800) traces the history of mankind to the time of the Crusades. He drew attention to the interest and beauty of popular poetry by his *Ossian und die Lieder alter Völker* (1773), and especially by his *Volkslieder* (afterwards called *Stimmen der Völker in Liedern*, 1778-9), a selection of popular songs drawn from many languages, and showing his remarkable skill as a translator. One of his best books, *Vom Geiste der Ebräischen Poesie* (1782-3), was translated into English as *The Spirit of Hebrew Poetry* (1833). Consult the critical edition of Herder's complete works (32 vols. 1877-89) and Nevinson's *Herder and His Times*.

**Heredia, José Maria de** (1842-1905),



French poet, born in Cuba, of mixed Spanish and French blood. He formed one of the group of innovators surrounding Leconte de Lisle, known as 'Les Parnassiens.' The watchword of the school was 'form,' technical perfection being held of supreme importance. Heredia's sonnets, collected under the title of *Les Trophées* (1893; trans. as *Sonnets* by E. R. Taylor, 3rd ed. 1902), proclaim him the undisputed master of that form of art, and one of Europe's most consummate artists in words. For the sonnets, done into English blank verse, consult Sewall's *The Trophies*.

**Heredia y Campuzano, José Maria** (1803-39), Cuban poet, a cousin of José de Heredia. In 1823 he was arrested for conspiracy against the government, and was condemned to perpetual exile. After a short period in New York, he went to Mexico, where he spent the rest of his life in retirement. Much of his work is clever adaptation, but his originality is placed beyond dispute in pieces such as *Himno del desterrado*, *Desengaños*, the *Epistle to Emilia*, and the *Ode to Niagara*. His lofty imagination gives him a high place among Spanish-American poets.

**Heredity**, in biology, a term designed to express and to explain the generalization that offspring resemble their parents. This resemblance rests on the fact that parents and offspring develop from similar living material in similar environments. If the environments are unlike, parents and offspring may be very unlike, yet a resemblance due to heredity will persist. Thus, a spruce tree grown on a bleak mountain side may be dwarfed and twisted by storm and exposure but seedlings from its cones, if grown in a normal environment, will be normal, tall, straight spruce trees.

It was Weismann who first made clear the fact that environmental effects are not hereditary, but end with the generation in which they made their appearance. This he expressed in the generalization *acquired characters are not inherited*, a proposition which has been modified somewhat but never disproved. Given a stable environment organic forms do not change from generation to generation unless the living substance, from which new individuals arise, changes.

What part of the living substance is concerned in heredity has long been a matter of conjecture and experiment. Scientists have reached certain tentative conclusions which added experiment seems to confirm. First, the nucleus of the cell is indispensable to heredity, for (1) a fertilized egg from which

the sperm nucleus is eliminated shows no paternal inheritance, but only characters of the mother, and (2) a fertilized egg which retains only the sperm nucleus, the maternal nucleus being eliminated, shows only paternal characters. Next, nuclear structures known as chromosomes contain the material representatives of characters which conform with Mendel's law in heredity. Chromosomes appear under the microscope as minute streaks in the nucleus of the cell. Each species of animal or plant has a definite and characteristic number of chromosomes in each of its cells. In many cases the chromosomes are of different sizes and shapes in the same cell, and in general those of each sort occur as a pair, one member of which was derived from the egg cell (mother) and one from the sperm cell (father). In fact, it is found that the egg cell and the sperm cell of each species, in general, have only half as many chromosomes as the zygote, the term applied to the united egg and sperm; the gamete (egg or sperm) contains one of each kind of chromosome characteristic of the species. The zygote naturally contains two, after egg and sperm have united in fertilization.

The diploid (or double) chromosome number persists in all cells of the individual, as a rule, until the gametes are formed. Then there occurs a reduction; one of each pair of chromosomes is thrown out of egg or sperm at maturation. Thus the half-chromosome number is produced in the gametes, but the double condition is restored at fertilization, so the new generation will have the same characteristic chromosome number as its predecessor. But it is unlikely that any individual will transmit in a single gamete exactly the same group of chromosomes as he inherited from one of his parents. Such would be a rare chance event. For if he receives from one parent chromosomes *A, B, C*, and from the other parent chromosomes *a, b, c*, then the chances are even that he will transmit the following chromosome combinations: (1) *A B C* and *a b c*, (2) *A B c* and *a b C*, (3) *A b C* and *a B c*, (4) *a B C* and *A b c*. With a larger chromosome number, the chances diminish that an original parental assortment of chromosomes will reappear among the gametes produced by a descendant. Moreover, there is evidence that the individual chromosomes may change in composition in cross-bred individuals, as shown by the phenomenon of crossing over in linked inheritance. Accordingly, the conclusion is justified that so far as the material basis of heredity is con-

cerned, bisexual reproduction is a continuing source of variability. A similar conclusion follows from the study of the distribution of inherited characters from generation to generation.

The fundamental law of heredity was first discovered by Gregor Mendel, of Brunn, Austria, in 1866, in the course of hybridization experiments with garden peas. Mendel showed that when true breeding (self-fertilizing) varieties of peas are artificially crossed, the characters in regard to which the parent varieties differed are transmitted in an orderly way and appear in definite proportions of the progeny. If one parent variety has starchy (plump) seeds and the other has sugary (wrinkled) seeds, the cross-bred seeds are invariably starchy, but plants grown from them bear, in the same pod, both plump and wrinkled seeds in the numerical ratio, 3 plump to 1 wrinkled. The wrinkled seeds subsequently breed true, but only part of the plump ones do. Also, if yellow-seeded and green-seeded varieties are crossed, yellow seed color prevails (dominates) in the cross-bred seed, but in the next generation green seed-color (the recessive character) reappears in one-fourth of the seeds produced, and thereafter breeds true.

If a yellow starchy-seeded variety is crossed with a green wrinkled-seeded variety, the dominant characters alone (yellow and starchy) are seen in the progeny, but the recessives reappear in the next generation, and all possible combinations of the two pairs of characters are produced, on the average, in the proportions, 9 yellow starchy: 3 yellow wrinkled: 3 green starchy: 1 green wrinkled. Each dominant character occurs three times as often as its recessive, but each pair is independent of the other, so that the combined result is the product of the two pairs, algebraically expressed,  $(3A+a) \times (3B+b) = 9AB + 3Ab + 3aB + ab$ .

Mendel's law involves the following principles: (1) The differences between two varieties can be arranged in contrasted pairs, one member of each pair being dominant over the other. (2) A cross-bred individual ( $Aa$ ) will show only the dominant member of each pair ( $A$ ) but will transmit the two separately and with equal frequency ( $A$  and  $a$ ). A recessive individual ( $aa$ ) will breed true, since it does not contain the dominant character ( $A$ ). But dominant individuals are of two kinds, one of which will breed true ( $AA$ ), while the other kind will not breed true ( $Aa$ ) but will transmit in half its gametes the re-

cessive character ( $a$ ). (3) Each character pair is transmitted independently of every other pair. On the chromosome theory—developed since Mendel's time—each character pair has its material basis in a different chromosome pair, hence their independent segregation in gametogenesis. From this same theory it should follow that characters whose determiners lie in the same chromosome should show a tendency to go together in transmission. They do. This is the phenomenon of gametic linkage, which was also unknown to Mendel. The chromosome theory, with its corollaries, such as genetic linkage, has been established by the brilliant work of T. H. Morgan and his pupils, based chiefly on the study of the banana fly, *Drosophila*. This fly has four pairs of chromosomes and all the varietal differences which have been discovered within this species—several hundred have been described—are transmitted in four linkage groups, each group of linked characters being transmitted in a different chromosome.

The name gene has been given to the agents in the chromosome which transmit hereditary traits or Mendelian characters. Photomicrographic studies of linkage show that the genes are probably arranged in a single row in each chromosome like a string of beads. A gene is supposed to be an organic chemical substance which has the property of initiating metabolic processes at an appropriate time and place in the development of the individual, so as to produce a particular bodily characteristic, the Mendelian character in question. The order of the genes in the chromosome has no relation to the arrangement of structures in the body. Thus, in *Drosophila* the same chromosome may contain genes which control the production of characters in eyes, wings, and legs. In the rabbit, the same chromosome contains a gene which determines whether the hair shall be long or short, and whether the coat shall be spotted or unspotted.

Mendelian inheritance depends on the existence in a species of two alternative states of the same gene. It is only when such differences exist that we can follow the course of a gene in transmission, or gain any knowledge of its existence. Gene changes are apparently discontinuous and abrupt in origin. They are often designated *mutations*. When a species, like the common gray rat, suddenly produces a snow white albino variety, this is due to a change in a single gene contained in a particular chromosome of its germ-cells.

The gene in question is one whose activity is indispensable to the development of any pigment in the skin of the rat. In some cases a gene has been known to assume more than two alternative forms. A hybrid between any two of these will transmit those two conditions but no others. Thus, each alternative form is seen to be very stable and not to be convertible at will into any other form. Genes seem to be as stable and their states as discontinuous as molecules.

There are characters whose inheritance does not depend on the action of a single gene, but upon the joint action of two or more genes which may lie in different chromosomes. Such characters, after being lost by mutation in one or more of the genes concerned, may suddenly be recovered when different varieties are crossed.

This is the phenomenon of reversion or atavism, and is well illustrated in a case observed by Darwin. When different color varieties of the domestic rabbit are turned loose together in a warren, it often happens that the young revert to the ancestral gray color of wild rabbits.

Many inherited characters seem not to follow Mendel's law, perhaps because they involve so many genes located in so many different chromosomes that simultaneous segregation of all of them so as to recover a particular combination (character) must be a rare event. There is in many species of animals and plants a pair of chromosomes involved in the determination of sex, one member of the pair being *different* in the two sexes. Genes located in this pair of chromosomes are the vehicle of what is known as sex-linked inheritance, since the characters in question are unequally represented among the two sexes, in some cases being restricted to one sex. This is a modified form of Mendelian inheritance and has been shown to occur in man (inheritance of color blindness), in birds, fishes, and insects. The chromosome basis of such inheritance has been demonstrated by microscopic studies controlled by breeding experiments.

Intensive experimental studies of heredity have thrown light on the much debated question of the effects of inbreeding and cross-breeding. The basic biological fact which underlies the practice of animal and plant breeders is this, that two gametes which are not exactly alike will produce a more vigorous zygote than two gametes which are exactly alike. This is why, in general, cross-fertilization is more advantageous than self-fertiliza-

tion among flowering plants, which have numerous devices to ensure the occurrence of cross- rather than self-fertilization. It also explains the wide prevalence of bisexuality among animals, making self-fertilization impossible. Continuous inbreeding, as for example in brother-sister matings, has a tendency to make all gametes alike in chromosome composition and to diminish the vigor of the stock. Inbreeding is an important agency for the improvement, purification, and standardization of domestic races of animals, but the chief value of such pure breeds is for crossing with common stock, or at any rate with a different race, in which process the maximum benefits of cross-breeding are secured.

Consult Bateson's *Mendel's Principles of Heredity* (1913); Conklin's *Heredity and Environment* (1914); East and Jones' *Inbreeding and Outbreeding* (1919); Morgan's *The Physical Basis of Heredity* (1919); and *Theory of the Gene* (rev. ed. 1928); Castle's *Genetics and Eugenics* (1924); Jennings' *Biological Basis of Human Behavior* (1930).

**Hereford**, city, England, on the Wye, here crossed by a 15th-century stone bridge and the Victoria Suspension Bridge. Remains of the ancient town walls and many old buildings are still to be seen. Notable features are the Cathedral, built in 1080-1150, and containing many ancient monuments and an interesting library; and Old House, a picturesque example of a half-timbered dwelling, built in 1620. Industrial establishments include a munitions factory, tanneries, and manufactures of tiles; p. 23,322.

**Herefordshire**, county, England, celebrated for cattle, sheep, and horses. Hops, cider, and perry are produced. Among ancient remains are Arthur's Stone, numerous British intrenchments, traces of Offa's Dyke, and Watling Street; p. 113,118.

**Hereros**, a section of the Bantu race in Damaraland, South Africa. In 1904-06 the Hereros were in open revolt against the Germans. See GERMAN SOUTHWEST AFRICA.

**Heresy**, a term applied to views or doctrines at variance with prevailing or standard beliefs, but generally restricted to the sphere of theology. It is to be noted that the New Testament condemns false teaching on the ground of its moral concomitants or results rather than as intellectual error pure and simple; it was left for a later time to deny salvation to all who did not accept the church's doctrines in their entirety. The various heresies that have vexed the churches

are treated in separate articles, ESSENES, Gnosticism, etc. See also CHURCH, HISTORY OF THE, and ROMAN CATHOLIC CHURCH.

**Hereward the Wake**, English patriot. After the Norman Conquest he retreated to the marshy fens of the Isle of Ely, where for a year he held out against William the Conqueror. Being finally driven out, Hereward escaped, but his subsequent fate is not certain. His career is depicted in Charles Kingsley's *Hereward the Wake*.

**Herford, Oliver** (1863-1935), American humorist. He illustrated his books of light verse with his own drawings. They include *The Little Book of Bores*, *Rubaiyat of a Persian Kitten*, *Excuse It Please*.

**Hergesheimer, Joseph** (1880-1946), American author. His novels, which have won for him a place in the front rank of the later American writers, include: *The Lay Anthony* (1914); *Mountain Blood* (1915); *The Three Black Pennys* (1917); *Java Head* (1919); *Cytherea* (1922); *The Bright Shawl* (1922); *Tampico* (1926); *Swords and Roses* (1929); and *Tropical Winter* (1933).

**Hergest, Red Book of**, ancient MS. of Welsh literature, dating from the 13th and 14th centuries. It takes its name from Hergest Court, a seat of the Vaughan family, where tradition asserts it was written. It contains, in addition to a mass of other material, eleven tales in Welsh, the latter collection being termed *Mabinogion*. The stories chiefly relate to the deeds of the legendary King Arthur and the mythical early British kings.

**Hering, Constantin** (1800-80), German-American physician, went to the United States in 1833, and founded in Philadelphia the first homeopathic school in the world. He founded the *American Journal of Homeopathic Materia Medica*, and published *Rise and Progress of Homæopathy* (1834), *Condensed Materia Medica*, and *Effects of Snake Poison* (1837).

**Hering, Ewald** (1834-1918), eminent German psychologist and physiologist. His original and especially valuable work was done in investigating space perception, memory, color vision, and Weber's law. His works include *Die Lehre vom binocularen Sehen* (1868); *On Memory as a General Function of Organized Matter* (1897); and *Zur Theorie der Nerventhätigkeit* (1899).

**Heriot**, in feudal law, customary tribute (usually a suit of armor, the best beast, or other article of personal property) exacted by the lord of his tenant on the latter's suc-

ceeding to the land by inheritance. The practice long prevailed in England as an ordinary incident of the form of land tenure known as Copyhold, and it still survives in a few ancient manors.

**Heritable and Movable**, the primary classification of property in Scots' law, corresponding roughly to the common-law classification of property as real and personal, heritable property being such as descends to the heir and movable such as passes to the next of kin on the death of the owner intestate. In English and American law heritable has the same signification.

**Herkimer**, village, New York, county seat of Herkimer co. The scenery along the Mohawk Valley is picturesque, and Fort Herkimer in the neighborhood is of interest. Herkimer is a market for dairy products, has manufactures of flour, furniture, and gloves and knitting mills; p. 11,345.

**Herkimer, Nicholas** (c. 1715-77), American soldier in the Revolutionary War, was born in New York. He was made a brigadier-general of the N. Y. militia in 1776. In his expedition for the relief of Fort Stanwix (1777), then besieged by St. Leger, Herkimer had his leg broken by a musket-bullet, but he contrived to direct the battle but succumbed a few days afterward.

**Herkomer, Sir Hubert von** (1849-1914), English portrait and subject painter, etcher, and engraver. Herkomer's work includes mezzotint engravings and etchings as well as oil and water color paintings. He excels in portraiture, in which his excellent technique is strongly marked. Among his numerous paintings are *The Last Muster* (1874); *The Chelsea Pensioners in Church* (1874); *Eventide* (1878); *God's Shrine* (1880); *Pressing to the West* (1884); and the portraits *The Lady in White*; *The Lady in Black*; *Tennyson*; *Ruskin*; *Herbert Spencer*; *Hans Richter*, and others.

**Hermæ**, square stone pillars, rudely carved with a representation of the god Hermes or Mercury. They stood at the entrance of all private and public buildings in Athens, at the boundaries of estates and countries, and at city gates. Their mutilation in 415 B.C. led indirectly to the disgrace and exile of Alcibiades.

**Hermandad**, or Holy Brotherhood, an association of towns in Aragon, Castile, and León, formed about the middle of the 13th century for their mutual protection against the nobles. By the middle of the 16th century it became extinct. The name was transferred

to a body of military police in the pay of the council of Castle.

**Hermannstadt**, (Hung. *Nagy-Szeben*), town, Roumania. The principal features are the numerous churches, and the antique town house containing the 'Saxon' archives. Distilling, pottery-making, milling, and other industries are carried on. From 1692 until the close of the Great War it belonged to Hungary; p. 25,000.

**Hermant, Abel** (1862- ), French author and dramatist. He is honorary president of the Société des Gens de Lettres and a member of the Legion of Honor. His best known works are: *La carrière* (1894); *La meute* (1896); *Sylvie, ou la curieuse d'amour* (1900); *Mémoires pour servir à l'histoire de la société* (1905); *Le caravansérail* (1917); *Le petite femme* (1921).

**Hermaphrodite**, an organism in which the two sexes are united. Hermaphroditism is the rule in flowers which typically contain both stamens and pistil, and is not uncommon in animals, especially in parasites and simple forms. The condition may be normal to the species, or may occur sporadically in certain individuals. In vertebrates, especially in the higher forms, abnormalities in development sometimes give to one sex the external appearance of the other, but that is not hermaphroditism. In true hermaphrodites there is usually, though not invariably, cross-fertilization, as in earthworm, leech, and snail; and, as in flowers, there may be elaborate means to attain this end.

In some animals there is embryonic hermaphroditism, the developing young containing rudiments of both male and female organs. A plausible explanation of sporadic hermaphroditism, as it occurs, for example, in the frog, is that it is a persistence of embryonic conditions. In all vertebrates with distinct genital ducts the embryo is so far hermaphrodite that it exhibits the ducts proper to both sexes, and in birds, reptiles, and mammals the male ducts abort in the future female, the female in the future male. See *The Evolution of Sex*, by Geddes and J. A. Thomson (2d ed. 1900).

**Hermaphroditus**, a son of Hermes and Aphrodite, who became united with the nymph of the fountain of Salmacis, near Halicarnassus, the two forming one person, with the characteristics of both sexes.

**Hermas**, one of the apostolic fathers, and author of a quasi-pocalyptic work, the *Pastor* or *Shepherd*, which has been called the *Pilgrim's Progress* of the early church. The

*Shepherd* was held in great esteem in the ancient church, and is a valuable source of information regarding the condition of the Roman community in the 2d century. See Zahn's *Der Hirt des Hermas* (1868); and Taylor's *The Shepherd of Hermas* (1901).

**Hermes**, called **Mercurius** by the Romans, one of the Greek gods, was the son of Zeus, and was born in a cave in Mount Cyllene in Arcadia. When Hermes grew up, Zeus made him the herald and messenger of the gods; it was also his duty to guide the souls of the dead to the lower world. As the herald of the gods, he was the patron deity of eloquence; as the god of prudence and cunning, he was worshipped by merchants and traders; and his reputation for ingenuity caused him to be regarded as the author of the lyre, the alphabet, numbers, gymnastics, weights and measures, etc. He was also worshipped as the patron of roads and travelers; hence the statues called *Hermæ* were set up to him on roads and at the entrances of buildings. His regular attributes are a broad-brimmed cap, the herald's staff or caduceus, and the winged sandals which bore him on his journeys.

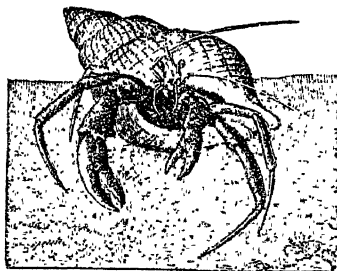
**Hermetic Books**, a sort of encyclopædia of ancient Egyptian lore, of which fragments only survive. The name is derived from Hermes Trismegistus, the Greek designation of Thoth, the Egyptian god of intelligence. As the lore contained in these books was traditionally believed to have been mastered and guarded with jealous care by a comparatively small number of experts, the term 'hermetic' came to be almost synonymous with esoteric—something reserved to the initiated only.

**Hermit**, one who retires from society in order to live a solitary life of meditation and devotion. During the persecution under Decius, Paul of Thebes took up his residence in the Egyptian desert. The real father of Egyptian anchoritism is St. Anthony. Occasionally strange and fanciful forms of separation were adopted—by the Stylitæ, the most famous of whom was one Simeon, who lived for years on the top of a pillar; and the Bosci, or Grazers, who lived on herbs. As Christianity spread to the w. and n., the rigors of climate tended to prevent the transportation of hermitism, and its place was largely taken by monasticism. The solitary devotee is a feature of many religions, both ancient and modern, notably in Buddhism.

**Hermitage**, a dry, red wine from the vineyards of the Rhone valley. It resembles

burgundy in body and color, at the same time possessing all the elegance of the best clarets.

**Hermit-crab**, a decapod crustacean of the family Paguridae, characterized by its habit of appropriating empty gasteropod shells, in which it lives, in order to shelter and protect its hinder part, abdomen, which is soft and defenceless.



*Hermit-crab in Shell.*

**Hermite, Charles** (1822-1901), French mathematician, was born at Dieuze, in Lorraine. He investigated especially the line of functions, the theory of algebraic forms and the theory of numbers, and determined the solubility of the quintic equation.

**Hermit-thrush**, one of the most beautiful and interesting of the American thrushes, distinguished by the pure brown tint of its upper parts, the numerous sharply marked, wedge-shaped spots on its buffy breast, and rufous tail. Its song is remarkably melodious and 'spiritual.' This thrush is familiar throughout all the United States.

**Hermon** (modern Jebel esh-Sheikh), triple snow-clad mountain peak (alt. 9,200 ft.), Syria. It is encircled with ruins of ancient temples dedicated to Baal worship, and is often referred to in Hebrew poetry.

**Hermopolis Magna**, vil., Upper Egypt, l. bk. of the Nile, opposite to the famous rock tombs of Beni-Hassan. It is the modern Ashvanein or Eshmunein; p. 14,518.

**Hermupolis**, or **Syra**, cap. of the Greek monarchy of the Cyclades, on the e. coast of the island of Syra, and center of the Levant trade, with shipbuilding, and manufacture of 'Turkish delight,' cotton, flour, leather, etc. It is the seat of a Greek archbishop and a Roman Catholic bishop; p. 21,000.

**Herne, James A.** (1840-1901), American actor and dramatist, was born at Troy, N. Y. His impersonation of 'Uncle Nat' Berry, in *Shore Acres*, was one of the distinct achievements in American comedy. See *Strang's Fa-*

*mous Actors of the Day In America* (1900).

**Herne the Hunter**, an old English legendary character who roamed at midnight round a famous oak in Windsor Forest, popularly supposed to have been blasted by the evil spirit of the hunter, assuming the shape of a great stag with huge horns. Shakespeare alludes to the legend in *The Merry Wives of Windsor*. Herne's Oak, supposed to be 650 years old, fell from natural decay in 1863. On the spot where it stood Queen Victoria planted a young oak.

**Hernia** is the protrusion of an organ or of part of an organ from its natural position in the body. The term is commonly restricted to intestinal hernia. A loop of bowel may be forced upward through the diaphragm (diaphragmatic hernia), or more often, and especially in children, it may be umbilical, the bowel being naturally pushed through the abdominal wall at its weakest point. Among adult women a similar weak point in the abdominal wall exists at the femoral ring, through which the great blood vessels pass from the abdomen to the leg; and in both men and women the inguinal canal is frequently the site of hernia. The hernia may consist of bowel and omentum, or of omentum alone; but in either case as it is protruded it pushes in advance layers of the various tissues through which it passes, so that the external tumor consists of the hernia plus certain coverings, the outermost of which is the skin. Hernia, whether femoral or inguinal, is commoner in men than in women. Certain subjects, however, are predisposed to hernia by weakness or malformation, either congenital or acquired—as the result of previous operation upon the abdominal walls, or as the result, in women, of the relaxation of the abdominal walls which follows child bearing. Lifting a heavy weight, violent coughing, or straining at stool may produce hernia.

Hernia is technically described, according to its condition, as Reducible, Irreducible, Strangulated, Incarcerated, Inflamed, or possibly Gangrenous. A hernia is never safe unless reduced and prevented from returning, either by a truss or by operation, which consists in cutting down on the hernia, freeing it from all constriction, returning it to the abdominal cavity, and then closing up the passage by which it descended.

**Hernici**, Sabine people who dwelt in Latium in ancient Italy. Their chief town was Anagnia.

**Hero**, in Greek mythology. See *LEANDER*.

**Hero**, or **Heron**, of Alexandria, lived first or second century B.C., mathematician and physicist, was probably an Egyptian, but wrote in Greek. He invented a water clock, hydraulic organ, and compressed-air catapult; studied the determination of areas, volumes, and heights; described levers, wedges, screws, pulleys, a fire engine, a self-trimming lamp, an æolipile, and a theodolite; is credited with the invention of a rudimentary form of steam engine; and discovered the formula for the area of a triangle in terms of its sides.

**Herod**, or **Herodes**. (1.) **HEROD**, called the **GREAT** (?74 B.C.), king of the Jews, was of an Indumæan family. He amassed great wealth by confiscating the property of his enemies, which he expended on the restoration of Samaria, the building of Cæsarea, and the Temple at Jerusalem. It was in the last year of his life that he ordered the 'massacre of the innocents' at Bethlehem.

(2.) **HEROD ANTIPAS**, son of Herod the Great, became tetrarch of Galilee and Peræa. He married Herodias, his brother Philip's wife, and imprisoned and executed John the Baptist for censuring this act.

(3.) **HEROD AGRIPPA I.**, called the **GREAT**, was the son of Aristobulus, son of Herod the Great. In 44 A.D. he had the Apostle James executed and Peter imprisoned.

(4.) **HEROD AGRIPPA II.** (30-100), son of the above. It was before this Agrippa and Festus that the Apostle Paul made his defence at Cæsarea.

**Herodianus**, Greek historian of Rome, who appears to have lived chiefly at Rome. His *History* covers the period from the death of Marcus Aurelius in 180 to the beginning of the reign of Gordian III. in 238.

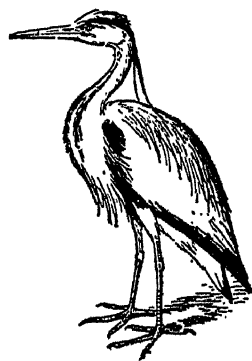
**Herodotus** (484-424 B.C.), sometimes called the 'Father of History,' is the first of the Greek historians whose works have come down to us. The main subject of the latter was the war between Persia and Greece, in which he saw the final issue of a struggle that had been going on for centuries between the East and the West. Consequently he begins with what he considers to have been its causes, and introduces digressions and episodes which had a more or less close connection with his subject. But his work is not merely a bare narrative of facts. Herodotus had a theory of history, partly philosophical, partly theological, and the facts are marshalled and interpreted in accordance with it. The theory was a modification of the old Greek belief in 'the golden mean.' Whatever exceeded a just proportion was supposed to

excite the envy of the gods, and to bring with it punishment and disaster; hence it was that the pride and power of Xerxes were doomed to failure. The work of Herodotus contains much that is derived from popular legend and the fictions of the professional dragoon, and in so far as is an invaluable storehouse of ancient folklore. The best English edition is that of Rawlinson. Consult J. B. Bury's *Ancient Greek Historians*.

**Heroic Verse**, the name applied to the English rhyming decasyllable, with a well-marked break in the sense after each second line, as distinguished from the form in which the sense overflows from one couplet into another. It was chiefly used by Dryden.

**Heroin**, or **Heroine**,  $C_{17}H_{17}(C_2=H_2O)-N_2O_3$ , diacetyl-morphine hydrochloride, is a white, crystalline, somewhat bitter powder, almost insoluble in water and ether, readily soluble in hot alcohol. Introduced into medical practice about thirty years ago, heroin has been used as a cough sedative and respiratory stimulant in phthisis, dyspnoea, cardiac dilatation, aneurism of the aorta, and uræmia, especially in cases intolerant of morphine and codeine. The constantly increasing number of habitual heroin users, however, has led to its classification among the dangerous drug habits. See **DRUG HABITS**.

**Héroid, Louis Joseph Ferdinand** (1791-1833), French musical composer, born in Paris. His reputation rests on three operas—*Marie* (1826), *Zampa* (1831), *Le Pré aux Clercs* (1833). The overture to *Zampa* has been very popular.



*Great Blue Heron.*

**Heron**, a bird of the numerous species of the genus *Ardea*, of the family *Ardeidae*. Herons are shy birds, solitary during feeding, but breeding in large colonies, making

rude nests of sticks in trees, and laying greenish or bluish unspotted eggs. They are most numerous in hot countries. America has many species of herons, most numerous in the Southern States. A common species of the temperate parts is the Green Heron, Great Blue Heron, the Great White or Florida Heron, the Great White Egret, and the Little White Egret.

**Herophilus**, a physician of antiquity, a native of Chalcedon in Bithynia, and contemporary in the 4th and 3d centuries B.C. with Ptolemy Soter. Settling at Alexandria, he was one of the first founders of the medical school there, and practised dissection of animals and human bodies.

**Herpetology**, that branch of natural history which has to do with Reptiles.

**Herrera, Fernando de** (c. 1534-97), Spanish poet, chief of the so-called 'Seville school,' was born in Seville. His odes, the finest of which is that of the victory of Lepanto, are remarkable for grandeur, melody, and profundity. His sonnets are especially admired as models.

**Herrera, Francisco de** (1576-1656), Spanish painter, called EL VIEJO (the Elder), to distinguish him from his son, El Mozo (the Younger), was born in Seville. Being a carver in bronze, he was accused of coining false money, and took refuge in the Jesuits' College, Seville, where he painted his famous *St. Hermengild in Glory* (Seville Museum). Other of his notable works are the *Last Judgment*, *Fall of Manna*, *St. Basil*, all in Seville; *Israelites Gathering Manna in the Desert*, in the Louvre, Paris, and *Christ Disputing with the Doctors*, National Gallery, London.

**Herrera, Francisco, El Mozo** (1622-85), son of EL VIEJO, Spanish painter, was born in Seville. He fled from his father's cruelty to Rome, and there became renowned for his depiction of still life, flowers, fruit, and fish. In 1661 he went to Madrid, where he was appointed painter to the king, and was commissioned to decorate the chapel of the church to Our Lady of Atocha. These frescoes, *The Assumption of the Virgin*, are his chief work.

**Herrera y Tordesillas, Antonio de** (1549-1625), Spanish historian, was born in Cuéllar. His principal work is *Historia general de los hechos de los Castellanos en las Islas y Tierra Firme del Mar Océano 1492-1554* (4 vols. 1601-15).

**Herreshoff, John Brown** (1841-1915), American naval architect, was born in Bristol, R. I. Although he became totally blind at the age of fifteen, he won a great reputation

by his skill in designing vessels. He and his brother Nathaniel designed and built the *Vigilant* (1893) and subsequent defenders of the America's Cup.

**Herreshoff, Nathaniel Green** (1848-1926), American shipbuilder, was born in Bristol, R. I. He designed and constructed at his yards numerous vessels, including torpedo boats and yachts. Among the products of his art have been the *Vigilant*, *Defender*, *Columbia*, *Reliance*, and *Resolute*, winners of international yacht races for the America's Cup.

**Herrick, Myron T.** (1854-1929), American diplomat, was born in Huntington, O. From 1912 to December, 1914, he was U. S. Ambassador to France and was again appointed to the position in 1921.

**Herrick, Robert** (1591-1674), British poet, the son of a goldsmith, was born in London. He was educated at Cambridge and in 1619 accepted the country vicarage of Dean Prior in Devonshire, where he wrote his finest poems. Herrick's poems have an undisputed lyrical quality and a fresh natural charm. He regards country life and ways, flowers, and rural scenes with the eyes of an idyllist. Among his most famous verses are *Gather Ye Rosebuds, Whenas in Silks My Julia Goes*, and *Cherry Ripe*. His *Complete Works* were edited in 1869 and 1876 and *Collected Poems*, in 1891, 1893, and 1914.

**Herrick, Robert** (1868-1938), American man of letters, was born in Cambridge, Mass. He is the author of *The Man Who Wins* (1895); *Literary Love Letters and Other Stories* (1896); *The Master of the Inn* (1908); *Together* (1908); *A Life for a Life* (1910); *The Healer* (1911); *The End of Desire* (1931); *Sometime* (1933), and other works.

**Herring**, a fish belonging to the family Clupeidæ, of which there are many genera and over 100 species, most of them occurring in salt water. They are found in all northern seas, not far from the land. They furnish an important food supply and herring fisheries constitute a valuable industry. All members of the herring family are 'surface' or 'migratory' fishes, swimming in shoals, usually in midwater or near the surface, and feeding principally on minute organisms, especially crustacea, which they strain from the water by means of the sieve-like arrangement of the gill-rakers. The Common Herring is found throughout the North Atlantic. It is about twelve inches long, bluish in color, silvery beneath. The California Herring, closely resembling its eastern prototype, is found in great



abundance the length of the North Pacific. Other species, known as sardines and shad, occur on both the Atlantic and Pacific coasts and in the Great Lakes.

**Herring-bone**, in architecture, a term applied to the laying of bricks or stones diagonally, in order to give a better bond to the structure. It was a feature of Byzantine and Romanesque architecture, and the method is sometimes used in modern buildings.

**Herriot, Edouard** (1872-1944), French public official, was born in Troyes. In 1924-25 he was premier; later president of the Chamber of Deputies; again premier, 1932. He is an author of distinction, having contributed freely to leading French publications on topics of political, social, economic, scientific, and literary interest. His works include *Philon le juif* (1897); *La Russie Nouvelle* (1922); *La France dans le Monde*, 1933.

**Herrmann, Alexander** (1844-96), American prestidigitateur, was born in Paris. He gave exhibitions in all parts of the world, and acquired a great reputation as an entertainer.

**Herrmann, Augustine** (1605-86), American colonist, was born in Prague, Bohemia. In 1659 he went to Maryland and there founded the town of Cecil. He made a valuable map of Virginia and Maryland, first published in 1670.

**Herron, George Davis** (1862-1925), American clergyman and author, born in Montezuma, Md. He became a leader in the American socialist movement. His works include: *The Larger Christ* (1891); *The New Redemption* (1893); *Why I am a Socialist* (1900); *War and Peace under Socialism*; *Socialism and Spiritual Expansion*; *Woodrow Wilson and the World's Peace* (1922).

**Herschel, Caroline Lucretia** (1750-1848), astronomer, sister of Sir William Herschel, was born in Hanover, Germany. She discovered eight comets between 1786 and 1797, and many of the smaller nebulae and star clusters included in Sir William Herschel's catalogue, and in 1798 published for the Royal Society a catalogue of stars taken from Flamsteed's observations.

**Herschel, Sir John Frederick William** (1792-1871), English astronomer, son of Sir William Herschel, was born in Slough, Buckinghamshire. In 1834 he established an observatory at Feldhausen, near Cape Town, South Africa, for four years studied the southern heavens, discovering 1,202 pairs of close double stars and 1,708 clusters and nebulae. He was master of the Mint from 1850 to

1855. Beside carrying out his important astronomical studies, Herschel invented the photographic use of sensitized paper, discovered the use of hyposulphite of soda as a fixing agent, and made valuable researches on the undulatory theory of light. He wrote *Outlines of Astronomy* of which ten editions appeared (1849-69), and miscellaneous works published as *Essays* (1857) and *Familiar Lectures on Scientific Subjects* (1867).

**Herschel, Sir William** (1738-1822), British astronomer-royal, was born in Hanover, Germany. In 1781 he discovered the planet Uranus, which he called the Georgium Sidus, and in recognition of this achievement was awarded the Copley medal, elected a fellow of the Royal Society, and (1782) made private astronomer to George III. In 1783 he wrote his *Motion of the Solar System in Space*; also a paper, *On the Places of 145 New Double Stars*. He discovered two of the satellites of Saturn, the rotation of its rings, and the periods of rotation of Saturn and Venus, the binary stars, the constitution of nebulae, and added greatly to knowledge concerning the Milky Way. In 1789 he erected his famous telescope of forty feet focal length. Consult Holden's *Herschel's Life and Work*; Clerke's *The Herschels*; Sime's *William Herschel and his Work*.

**Hershey, Lewis B.** (1893- ). He was appointed director of the U. S. selective service system July 31, 1941.

**Hertford**, town, England. Interesting features are the church of All Saints, and Hertford Castle. The castle, now privately owned was the last residence of Isabella (1292-1358), widow of Edward II, and the prison of John, king of France, and David Bruce, king of Scotland. Two miles distant is Haileybury College; p. 10,712.

**Hertling, Georg, Count Von** (1843-1919), German writer and administrator, was born in Darmstadt. He entered the Reichstag in 1875, was employed by Bismarck during the *Kulturkampf* to secure concessions from Rome, and became leader of the Catholic centre. In 1917 he became chancellor of the German Empire and held that office when the treaties of Brest-Litovsk and Bucharest were concluded.

**Hertogenbosch**, town, Netherlands, capital of the province of North Brabant, 30 m. s.e. of Utrecht. It has a fine 15th century cathedral, a Raadhuis, and a museum of antiquities pertaining to the province. Cloth, hats, needles, and cutlery are manufactured; p. 38,446.



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The President Receives the Press, Washington, D. C. Newspaper men assembled to attend President Roosevelt's Press Conference.

**Herts.** See **Hertford.**

**Hertz, Heinrich Rudolf** (1857-94), German physicist, was born in Hamburg. While at Karlsruhe he carried out his remarkable experiments on electric waves, the existence of which formed the central feature of Maxwell's profound theory of electricity and magnetism. The great advance made by Hertz was the experimental demonstration of the existence of electro-magnetic waves of comparatively slow frequency. Wireless telegraphy is the practical development of the experimental facts established by Hertz and gives to the Hertzian waves an added importance. From this point of view his discoveries rank with Faraday's discovery of the induction of currents. Hertz also wrote valuable memoirs on problems in elasticity, and published shortly before his death a profound treatise on the foundations of dynamics. His important writings (*Gesammelte Werke*, 3 vols., 1894) have been translated into English by D. E. Jones, as *Electric Waves*, *Miscellaneous Papers*, and *Principles of Mechanics* (1899).

**Hertz, Henrik** (1798-1870), Danish dramatist, was born in Copenhagen, of Jewish extraction, but became a Protestant. His *Gjengangerbreve* (1830) is one of the best satires in the Danish language.

**Hertzian Waves.** See **HERTZ** and **ELECTRO-MAGNETIC WAVES**.

**Heruli, or Eruli**, a Teutonic nation, who, in the 5th century, A.D., invaded the Roman empire, and, under the command of Odoacer, put an end to the Western Roman empire in 476 A.D.

**Hervey, James** (1714-58), English religious writer, was born in Hardingstone. His chief work was *Meditations and Contemplations among the Tombs* (1745). His Calvinistic *Dialogues between Theron and Aspasio* (1755) provoked the active opposition of John Wesley and others.

**Hervieu, Paul Ernest** (1857-1915), French novelist and dramatist, was born in Neuilly-sur-Seine. His first book, *Diogène le Chien*, was published in 1882, and attracted attention by its originality and charm of style. It was followed by *La bêtise humaine* (1884), and *L'Armature* (1895); and by the plays *Point de lendemain* (1880), *La loi de l'homme* (1897); *La course du flambeau* (1901), and *Le dédale*.

**Herwegh, Georg** (1817-75), German lyric poet, was born in Stuttgart. In 1841 he published a volume of political poems *Gedichte eines Lebendigen*, which was confiscated by

the German police but which, nevertheless, attained great popularity.

**Herz, Henriette** (1764-1847), daughter of a Jew of Portuguese extraction, whose real name was Lemos. She was born in Berlin, and, owing to her beauty and her intellectual gifts, succeeded in making her home there the resort of such men as the Humboldts, Börne, the Schlegels, and Fichte. She was especially intimate with Schleiermacher.

**Herzen, Alexander** (1812-70), Russian author and publicist, was born in Moscow. He left Russia in 1846, and eventually established (1851) a printing press in London to advocate the cause of reform in his own country. Thence his two periodicals, the *Polar Star* and the *Bell* (*Kolokol*), were smuggled into Russia in thousands. He edited the works of Pushkin, Lermontov, and other Russian writers.

**Herzl, Theodor** (1860-1904), Jewish political leader, founder of the Zionist movement, was born in Budapest. In 1896 he produced *Der Judenstaat*, in which he advocated the founding in Palestine of an autonomous Jewish state under the suzerainty of Turkey, and in 1897 he presided over the first Zionist Congress at Bâle.

**Hesiod**, after Homer, the most famous of the early poets of Greece. The ancients usually considered him and Homer as contemporaries; but it is certain that Hesiod lived long after Homer. He has left us only two poems which can be considered genuine—the *Works and Days* and the *Theogony*—though the authenticity even of the latter is suspected by some critics. The *Works and Days* is the earliest didactic poem known to us in Greek. Hesiod is especially interesting as the earliest known spokesman of the lower classes, the toiling laborers of earth; he expresses their grievances, and bemoans their hard fate. It is his metre and the use of the epic dialect alone that caused him to be classed with Homer.

**Hesperides**, the daughters of Hesperus, were in Greek mythology the guardians of the golden apples given by Gæa to Hera on her marriage with Zeus.

**Hesperornis**, a fossil bird of the Cretaceous system, which had teeth in the jaws similar to those of reptiles. The remains of hesperornis are found in the upper Cretaceous rocks of Kansas; the average height of the living animals must have been about three feet. See Lucas's *Animals of the Past*.

**Hesperus** (Lat. *Vesper*), the Greek name



United States Army soldiers, with fixed bayonets, breaking up the picket line at North American Aviation Plant, Inglewood, Calif.

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of Venus as the evening star, was identified with the morning star both by Homer and Hesiod, under the name of Phosphorus (Lat. Lucifer).

**Hess, Peter von** (1792-1871), German historical painter, who painted scenes in the Napoleonic campaigns.

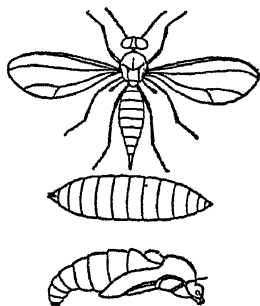
**Hess, Rudolf** (1894- ), Nazi leader and friend of Hitler. Landed by parachute in Scotland May 10, 1941 and was interned.

**Hess, Victor Frank** (1883- ), Austrian physicist, professor at Innsbruck University. Discovered that cosmic rays emanate neither from the earth nor from the atmosphere as previously supposed. He discovered that the rays increase with the distance from the earth's surface. He won the Nobel Prize for physics in 1936.

**Hesse-Cassel**, a former electorate of Germany. From the middle of the 18th century the landgraves of Hesse-Cassel were wont to hire out their subjects as mercenary soldiers.

**Hesse-Nassau**, prov. of Prussia. The Taunus region is famous for its mineral waters (Wiesbaden, Ems, Homburg, Schlangenbad, Soden, etc.). There is a good deal of manufacturing industry—iron works, gold and silver ware, leather goods, and stoneware factories; p. 2,455,000.

**Hessian Fly**, a gall-midge popularly supposed to have been introduced into North America by the Hessian troops at the time of the war of Independence. The adult female is a small fly under one-tenth of an inch in



*Hessian Fly*: imago, larva, and pupa.

length, with hairy legs, and velvety black, with blood red markings. The male is larger and rather different in color. During April the two sexes enjoy their brief period of aerial life, and then die. The larvae are very destructive to wheat.

**Hestia**, called *Vesta* by the Romans, was

one of the twelve chief divinities of ancient Greece; she was the daughter of Cronos and Rhea. She was the goddess of the hearth, or more particularly the fire on it, as representing the center of domestic life. Every town and state had also its central hearth, which was sacred to her.

**Hesychasts** 'Quietists', a sect of mystics of the Eastern Church, who arose among the monks of Mt. Athos in the 14th century. By protracted contemplation, with the eyes fixed on the navel, they thought that they came to see the 'Taboritic light,' or the divine light that shone on Mount Tabor at the transfiguration of the Lord.

**Hesychius**, Greek grammarian of Alexandria, who lived probably during the 4th century A.D. His only extant work is a dictionary, which is of great value not only for its explanations of existing words, but also as a collection of words otherwise unknown and as a storehouse of quotations from lost works.

**Hetairai**, in ancient Greece, and particularly at Athens, courtesans of the best class. They were often trained to play the flute or the lyre, or to dance; some studied philosophy, like Lashenia, the pupil of Plato, and Leontion, who was a hearer of Epicurus; but the most famous of all for her intellectual powers was Aspasia, the mistress of Pericles, who associated also with Phidias and Anaxagoras. The most famous of the hetairai besides those mentioned are Lais, Phryne, Pythionice, and Theodote.

**Heteropoda**, a group of gasteopod mollusks adapted for a pelagic life. The foot is not used for crawling, but, being laterally compressed, serves as a fin, and also as a means of attaching the body to the prey or to floating bodies. The animals, several known as 'sea-butterflies,' are inhabitants of all the warmer oceans, and are often exquisite objects.

**Heteroptera**, a sub-order of hemipterous insects, as contrasted with the other sub-order of Homoptera. In the Heteroptera the anterior wings are more horny than the posterior. Some are handsome and showy forms, while others, such as the bed-bug, are as repulsive in appearance as in habits.

**Hetman**, or **Ataman**, title of the chief army officer of the Cossacks; generally applied also to a Cossack chieftain.

**Hevelius**, or **Höwelke, Johannes** (1611-88), German astronomer, born at Danzig, where he lived and died. In 1641 he erected an observatory in his own house, furnished

it with large telescopes constructed by himself, and devoted his time to making astronomical observations.

**Hewitt, Abram Stevens** (1822-1903), American manufacturer and political reformer, was born at Haverstraw, N. Y. Through his efforts the open-hearth process of making steel was introduced in this country. He was mayor of New York in 1887-89. He continued after his administration to take an active interest in the city's affairs, and especially in the development of a rapid transit system. He was the benefactor of many of the city's institutions, and particularly of Cooper Union.

**Hewitt, Peter Cooper** (1862-1921), American electrician and inventor; born in New York. He invented devices to simplify the manufacture of glue, a hydroplane or 'gliding boat,' improved methods of hatching fish, and a mercury vapor tube lamp.

**Hewlett, Maurice Henry** (1861-1923), English novelist, was born in Shaw Hill, Addington, Kent. *The Forest Lovers* (1898) established his position as a writer of romance. Among his works are: *Little Novels of Italy* (1899); *New Canterbury Tales* (1901); *The Road in Tuscany* (1904); *The Fool Errant* (1905); *Lovers' Tale* (1915); *Wiltshire Essays* (1922).

**Hexagon** is any closed figure bounded by six straight lines, and having consequently six angles. The most important case is the regular plane hexagon, in which all the sides are equal, and also all the angles.

**Hexameter**, the standard verse form in the Latin and Greek languages. It is a measure containing six feet, of which the final foot must be a spondee (two long syllables) or a trochee (a long and a short), the penultimate normally a dactyl (a long and two shorts), and the remaining four feet either dactyls or spondees at discretion. In this meter the great classical epic and philosophical poems were written—the *Iliad*, *Odyssey*, *Aeneid*, and Lucretius's *De Natura Rerum*; and in the hands of Virgil it became what Tennyson calls 'the stateliest measure ever moulded by the lips of man.' Three modern English poets have employed the hexameter—Kingsley, in his *Andromeda*; Clough, in the *Bothie of Tober-na-Vuolich*; and Longfellow, in *Evangeline*.

**Hexateuch**, a term under which are grouped the first six books of the Old Testament. Origen applied the adjective *pentateuchos* to the five so-called books of Moses, and the word passed into popular speech as a substantive, *pentateuch*. The word *hexateuch* (Gr. *hex*, 'six') has been coined by an-

alogy, and is intended to indicate that Joshua is of similar origin and structure with the preceding five.

**Heyse, Paul Johann Ludwig** (1830-1914), German author, was born in Berlin. Until the rise of the modern literary school, headed by Hauptman and Sudermann, he was the best-known man of letters of his time in Germany. He obtained in 1885 the Schiller Prize for dramatic composition, and in 1910 the Nobel Prize for Idealistic Literature. He was a graceful and artistic writer, who excels in the short story, his strength lying in the skill with which he utilizes a piquant or telling situation. Good specimens of his work may be read in *Novellen* (1855-62); *Buch der Freundschaft* (1883-84). He also wrote longer novels—*Die Kinder der Welt* (1873, Eng. trans.) and *Im Paradiese* (1875).

**Heyward, Du Bose** (1885-1940), American author, was born in Charleston, S. C. His story of Negro life, *Porgy*, was dramatized and in 1927 the Theatre Guild produced it; it won the Pulitzer Prize. He also wrote *Mamba's Daughters* (1929), *Angel*, and *Peter Ashley*, a story of the period of the Civil War.

**Heywood, John** (?1497-?1580), English dramatist, was probably born in London. Having been introduced at court by Sir Thomas More, he became musician and provider of court entertainments to Henry VIII. His chief works are *A Mery Play Between the Pardoner and the Frere* (1533); *A Mery Play Between Johan the Husbände, Tyb the Wife, and Syr Jhan the Priest* (1533); *The Play of Love* (1533); *The Four P's*, a play (?1545); *The Spider and the Flie*, an allegorical poem (1556).

**Heywood, Thomas** (?1575-?1650), English dramatist, was born in Lincolnshire. He was the most prolific playwright of his time. He also wrote pageants, poems, lives, and *An Apology for Actors* (1612). *A Woman Killed with Kindness* (1603), his masterpiece, is one of the earliest and most touching examples of English domestic drama.

**Hezekiah**, king of Judah (726-697 B.C.), was the son and successor of Ahaz, and a contrast in every way to his weak and superstitious father. His intimacy with the Prophet Isaiah strengthened his native reforming zeal: he purged the land of idolatry, repaired the Temple, and reorganized and endowed the Levitical priesthood. He improved the position of Jerusalem as a stronghold, and wrested his country from the suzerainty of Assyria.

**Hiawatha**, a personage of miraculous de-

scient among the Iroquois. He is said to have been sent on earth to teach men the arts of peace and civilization. It was he who first gave maize to man for food, and taught navigation, also the science of medicine. Schoolcraft's version of the tradition in *Algic Researches* is the basis of Longfellow's poem.

**Hibben, John Grier** (1861-1933), American educator, was born in Peoria, Ill. He was elected President of Princeton University in January, 1912. He is the author of numerous works on philosophy, among which are *Inductive Logic* (1896); *Problems of Philosophy* (1898; new ed. 1908); *A Defence of Prejudice* (1911). He edited *Epochs of Philosophy* (1905); *The Higher Patriotism* (1915).

**Hibernation**, or winter sleep, is a very common phenomenon in warm-blooded animals inhabiting high latitudes, and is a means whereby they avoid the effects of famine and winter cold. In a hibernating animal the temperature of the blood may be greatly reduced, the heart beats feebly, the breathing is slow, and the function of digestion may be suspended. It may be said generally that hibernation begins with the lowering of the temperature and scarcity of food in autumn, and ceases when spring brings abundant food and warmth.

Where the winter sleep is profound, no food is eaten during its continuance, the animals living upon the stores of fat accumulated in summer, and waking thin and emaciated in spring. In other cases the winter nest contains stores of food laid up during the season of plenty; and to these the animal betakes itself whenever any rise of temperature induces activity. An interesting case of hibernation is that of the bears, for in several species—the black bear of North America—it seems to be the female only which hibernates, the male remaining active throughout the winter, or at least as long as food is obtainable. In the sleeping place of the female, the cubs are born, and the mother emerges with her young in spring in a voracious condition, and much more actively carnivorous than at other times.

**Hibernia**, called also *Ierne*, *Iverna*, or **Juvena**, the name by which Ireland was known to the ancient Romans.

**Hibernians, Ancient Order of**, a secret organization originally founded in Ireland about the time of the Cromwellian régime, for the preservation of Catholic religious rights. When these had been assured by the Catholic Emancipation Act of 1829, the or-

ganization became fraternal and benevolent, with the political object of Irish nationality. Branches were founded in Great Britain, and in 1860 the order was established in the United States. It advocates Irish nationality, aids with sympathy and funds the movements, literary and political, with that end in view, and has an efficient financial organization. Only Irishmen by birth and descent and of the Catholic faith can become members. The order in the United States has disbursed about \$10,000,000 in sick and funeral benefits since 1836.

**Hibiscus**, a genus of plants, of which there are about 150 known species, mostly tropical or subtropical, belonging to the order Malvaceæ. Most of the species bear attractive flowers, and many are cultivated. The Rose of Sharon is the most familiar cultivated species, and the swamp rose-mallow is common along the Atlantic Coast of the United States, and the region of the Great Lakes, generally in brackish marshes. The fruit of *H. Esculentus*, commonly called gumbo or okra, is widely used as food in the United States and the East and West Indies.

**Hiccough** (Hiccup), or **Singultus**, is a sudden spasmodic contraction of the diaphragm, accompanied by closure of the glottis. For a cure, a draught of cold water or the retention of the breath for a few seconds usually suffices.

**Hichborn, Philip** (1839-1910), American naval officer and inventor, was born in Charlestown, Mass. From 1893 to 1901 he was chief constructor of the Navy, retiring in the latter year with the rank of rear-admiral. He was the inventor of many appliances, including the Franklin life buoy and the Hichborn balanced turrets.

**Hichens, Robert Smythe** (1864- ), English novelist, was born in Speldhurst, Kent. His first novel, *The Green Carnation*, published anonymously in 1894, won immediate success for its brilliant wit and literary charm. *The Garden of Allah* (1904), a love story of a moving and poignant nature, presented with exceptional skill and insight, was dramatized and produced in New York City during 1911-12. Among his other works are: *The Way of Ambition* (1913); *The Spell of the Holy Land* (1914); *The God Within Him* (1926); *The Paradine Case* (1933). He has also published lyrics for music; collaborated with Wilson Barrett in the successful play *The Daughters of Babylon*, and was co-dramatist of *The Medicine Man* and *Becky Sharp*.